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RELIABILITY AND CONFIDENCE LIMITS FOR SAMPLE TESTING

Based on the Binomial Distribution Graphs for Sample Sizes From 1 to 100, and From 100 to 1,000 in Multiples of 10

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SUMMARY

There is frequent need to obtain information as to the attributes, characteristics, reliabilities, and capabilities of production items. Such information is required for logistic planning, tactical operations, and alternative uses and to determine that the supplier has met contractual specifications. The normal procedure involves the testing of a number of items that have been randomly chosen from a production lot.

In one type of acceptance sample testing, it is assumed that each item will be either a success or a failure, and no allowance is made for varying degrees of success. Upon completion of the testing, it is desired to determine, at a certain level of confidence, limits on the reliability of the entire lot from which the sample was selected.

Graphs are given here that may be used to determine either one-sided or two-sided reliability limits at any desired confidence level, based on the success ratio for the tested items. The sample is assumed to have been drawn from a population with unknown reliability p (percentage of good items). The graphs are for sample sizes from 1 to 100 and also from 100 to 1,000 in multiples of 10.

Two basic assumptions are possible in random sample testing: that of the binomial distribution and that of the hypergeometric distribution. The theory and the graphs of this report are based upon the binomial distribution. The binomial distribution is usually sufficiently accurate, but formulas for approximating the hypergeometric distribution from the binomial distribution values are given in the appendix.

INTRODUCTION

A common contract provision for acceptance of production items is a given probability of successful performance under specified conditions. An associated confidence level is usually either implied or stated. An accepted factor in any estimate of the quality of the produced item is this performance probability, often called reliability.

In 100-percent testing, how many units passed and how many failed is known, and thus the reliability is known. In sample testing, only the success and failure ratios for that sample and that test are known. This success ratio for a given test is the best estimate of the probability of successful performance on that test of an individual item of the remainder of the group of items. The probability of a randomly selected item of the untested items passing or failing the test is between 0 and 1, but any value between these limits has an associated upper and lower confidence level based on the sample test results. Correspondingly, for a given confidence level, there is an associated one-sided or two-sided population reliability limit. The definition of these confidence levels, as used here, together with their adequacy, is discussed in the section entitled "Theory."

This report presents graphs of the entire spectrum of confidence levels and the associated reliabilities determined by the sample testing results. The graphs are based on the binomial distribution theory. There are 190 graphs given, one for each sample size from 1 to 100, and from 100 to 1,000 in multiples of 10.

From these graphs and the actual number of successes, upper reliability bounds and associated confidence levels, and lower reliability bounds and associated confidence levels can be read. Reliability intervals for given levels of confidence can also be read. Conversely, the number of successes required for a particular sample to meet a stated reliability at stated confidence levels can be determined. The graphs can also be used to determine whether the sample falls within predetermined risk levels.

The binomial distribution theory assumes that the reliability of the items in the population remains unchanged as the sample is selected. For a finite population or a nonreplacement sampling plan, the exact theory is that of the hypergeometric distribution. Since the population size is usually large compared to the sample size, the binomial result is a good approximation to the hypergeometric. Hypergeometric distribution tables are given in reference 1. Formulas for approximating the hypergeometric distribution from binomial distribution values are discussed in the appendix.

SYMBOLS

n	Sample size
s	Number of items in a sample th[illegible]ss a given test
p	Population reliability
p_ℓ	Lower reliability limit
$C_\ell(p_\ell; s,n)$	Confidence level that $p \geq p_\ell$, given s and n
p_u	Upper reliability limit
$C_u(p_u; s,n)$	Confidence level that $p \leq p_u$, given s and n
$1 - C_\ell(p_\ell; s,n)$	Risk that $p < p_\ell$
$1 - C_u(p_u; s,n)$	Risk that $p > p_u$

THEORY

Consider the determination of an unknown population reliability p, based on the testing of a sample of n items randomly drawn from the population. The probability $\phi(j)$ of obtaining exactly j successes within the n items tested is given by the binomial distribution

$$\phi(j) = \frac{n!}{j!(n-j)!} p^j (1-p)^{n-j} \tag{1}$$

The probability of obtaining at most s - 1 successes in the sample of n is $\sum_{j=0}^{s-1} \phi(j)$. This probability is used by many authors as the definition of the confidence level that the reliability is at least p_ℓ, given s and n (see references 2 and 3); that is,

$$C_\ell(p_\ell;\ s,n) = \sum_{j=0}^{s-1} \phi(j) = 1 - \sum_{j=s}^{n} \phi(j) \tag{2}$$

It should be noted that, because of the discrete nature of the distribution, the probability that the reliability is at least p_ℓ is, in general, greater than $C_\ell(p_\ell;\ s,n)$. This is also pointed out in reference 3. In other words, the definition used for the level of confidence is conservative, and is most conservative when the size of the sample is small.

Conversely, the confidence level that the reliability is at most p_u, given s and n, is defined by

$$C_u(p_u;\ s,n) = \sum_{j=s+1}^{n} \phi(j) = 1 - \sum_{j=0}^{s} \phi(j) \tag{3}$$

Again, $C_u(p_u;\ s,n)$ is conservative.

Note that, for $s = 0$, $C_\ell(p_\ell;\ s,n) = 0$ for any p_ℓ greater than 0. For $s = n$, $C_u(p_u;\ s,n) = 0$ for any p_u less than 1. Note also that, if $p_u = p_\ell$, $C_u(p_u;\ s-1,n) = 1 - C_\ell(p_\ell;\ s,n)$. This fact makes it possible to combine graphs for p_ℓ and p_u.

THE GRAPHS

The graphs are given in figures 1 through 190. A separate graph is given for each sample size, n, from 1 to 100 and from 100 to 1,000 in multiples of 10. The vertical scale on the left side of each graph is for $C_\ell(p_\ell;\ s,n)$ and that on the right side is for $C_u(p_u;\ s,n)$. The graphs for n from 1 to 50 give separate curves for all possible number of successes, s, from 1 to n for p_ℓ, and from 0 to n - 1 for p_u. For n > 50, the values of s for which curves are actually plotted are entered on the appropriate curves. These values were chosen so that linear interpolation in the horizontal direction will give three-decimal accuracy. In most cases, if the graphs are plotted and read precisely, the error in linear interpolation in the horizontal direction will be considerably less than 0.001.

EXAMPLES

For the following examples, assume that $n = 10$ and $s = 5$. Then the graph of figure 10 is used, the fifth curve being used for p_ℓ and the sixth curve for p_u.

Example 1

Determine a 90-percent confidence interval for the population reliability.

In general, to determine the C% confidence level (two-sided symmetric interval) use $C_u = (1 + C)/2$ to determine p_u and $C_\ell = (1 + C)/2$ to determine p_ℓ. The reliability interval for the C% confidence level is then

$$p_\ell \leq p \leq p_u$$

For this problem,

$$C_\ell = \frac{1 + 0.9}{2} = 0.95$$

and

$$C_u = \frac{1 + 0.9}{2} = 0.95$$

Then from the graph of figure 10, p_ℓ is determined to be 0.22, and p_u is determined to be 0.78. Thus at the 90-percent confidence level, the required reliability interval is given by $0.22 \leq p \leq 0.78$.

Example 2

For

$$C_\ell(p_\ell; 5,10) = 0.8, \; p_\ell \approx 0.33$$

For

$$C_u(p_u; 5,10) = 0.8, \; p_u \approx 0.675$$

Thus for a 60-percent confidence interval,

$$0.33 \leq p \leq 0.675$$

Example 3

For

$$C_\ell(p_\ell; 5,10) = 0.9, \; p_\ell \approx 0.265$$

For

$$C_u(p_u; 5,10) = 0.9, \; p_u \approx 0.735$$

Thus for an 80-percent confidence interval,

$$0.265 \le p \le 0.735$$

NUMERICAL ANALYSIS

For computational purposes, using equation (1), it is convenient to write equation (2) in the form

$$C_\ell(p_\ell;\, s,n) = \frac{n!}{(s-1)!\,(n-s)!} \int_{p_\ell}^{1} x^{s-1}\,(1-x)^{n-s}\,dx \tag{4}$$

Then

$$\frac{\partial C_\ell(p_\ell;\, s,n)}{\partial p_\ell} = -\frac{n!}{(s-1)!\,(n-s)!}\, p_\ell^{\,s-1}\,(1-p_\ell)^{n-s} \tag{5}$$

and

$$\frac{\partial^2 C_\ell(p_\ell;\, s,n)}{\partial p_\ell^2} = -\frac{\partial C_\ell(p_\ell;\, s,n)}{\partial p_\ell} \times \frac{(n-1)\left(p_\ell - \frac{s-1}{n-1}\right)}{p_\ell(1-p_\ell)} \tag{6}$$

For $0 < p_\ell < 1$, the only point of inflection is at $p_\ell = (s-1)/(n-1)$. Equations (1), (2), and (5) in logarithmic form were used to evaluate $C_\ell(p_\ell;\, s,n)$ and $[\partial C_\ell(p_\ell;\, s,n)]/(\partial p_\ell)$ at $p_\ell = (s-1)/(n-1)$.

For $(s-1)/(n-1) < p_\ell < 1$, $C_\ell(p_\ell;\, s,n)$ was evaluated by numerical integration. The formula that was used is

$$C_\ell(p_\ell + h;\, s,n) = C_\ell(p_\ell;\, s,n) + \frac{h}{2}\left[\frac{\partial C_\ell(p_\ell + h;\, s,n)}{\partial p_\ell} + \frac{\partial C_\ell(p_\ell;\, s,n)}{\partial p_\ell}\right] - \frac{h}{12}\left[\frac{\partial^2 C_\ell(p_\ell + h;\, s,n)}{\partial p_\ell^2} + \frac{\partial^2 C_\ell(p_\ell;\, s,n)}{\partial p_\ell^2}\right]$$

The first derivative was calculated by the equation (derived from equation (5))

$$\frac{\partial C_\ell(p_\ell;\, s,n)}{\partial p_\ell} = \frac{\partial C_\ell(p_{\ell_0};\, s,n)}{\partial p_\ell}\left(\frac{p_\ell}{p_{\ell_0}}\right)^{s-1}\left(\frac{1-p_\ell}{1-p_{\ell_0}}\right)^{n-s}$$

The second derivative was calculated by equation (6).

For $0 < p_\ell < (s-1)/(n-1)$, $C_\ell(p_\ell;\, s,n)$ was calculated by the equation (derived from equations (1) and (2))

$$C_\ell(p_\ell;\, s,n) = 1 - C_\ell(1 - p_\ell;\, n + 1 - s,n)$$

For $s = 1$, $C_\ell(p_\ell;\, 1,n)$ was calculated by the equation (derived from equations (1) and (2))

$$C_\ell(p_\ell;\, 1,n) = (1 - p_\ell)^n$$

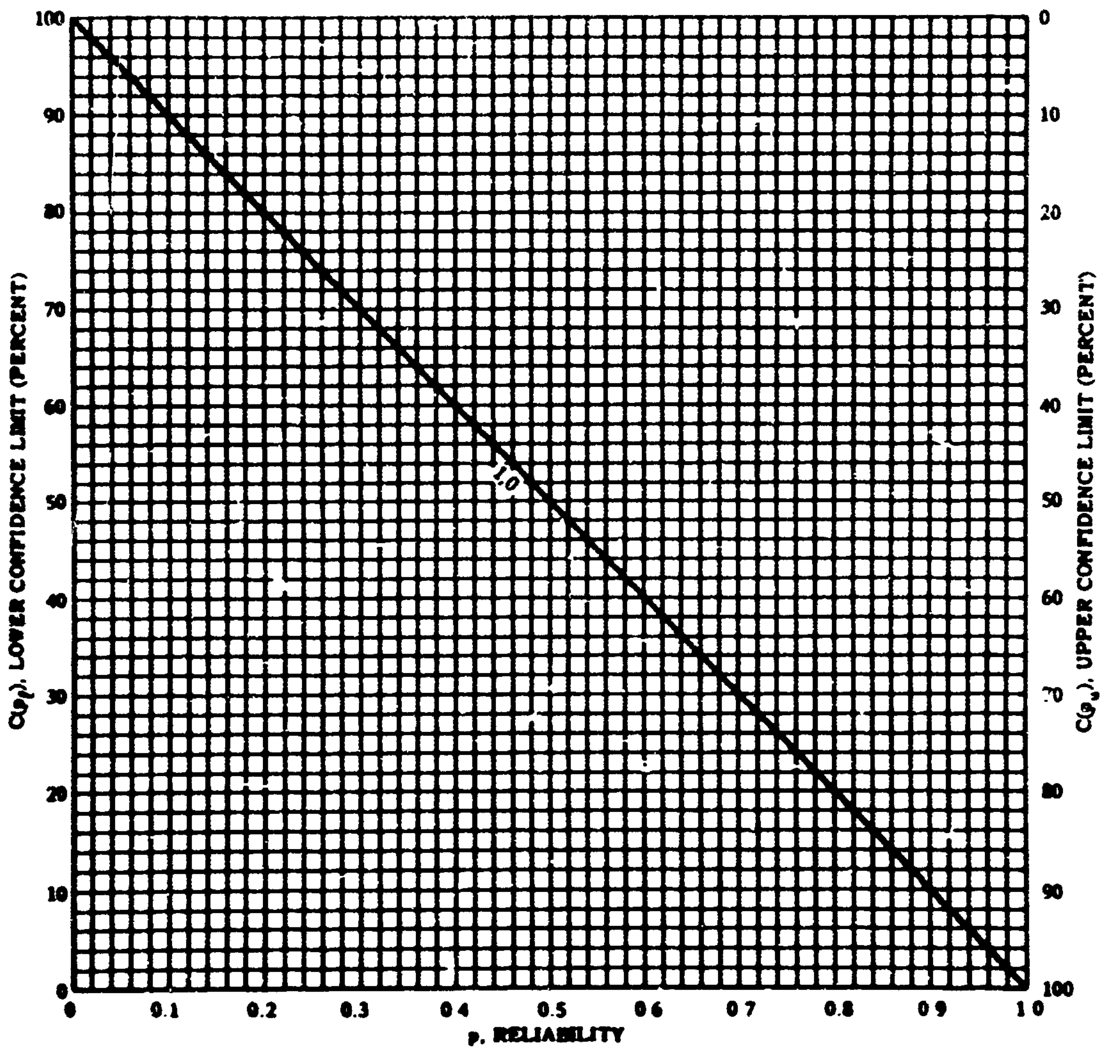
An estimate of the error in the method can be obtained at $p_\ell = 1$, since

$$C_\ell(1;\, s,n) = 0$$

The maximum deviation of the calculated value of $C_\ell(1;\, s,n)$ from 0 was less than 2×10^{-6}.

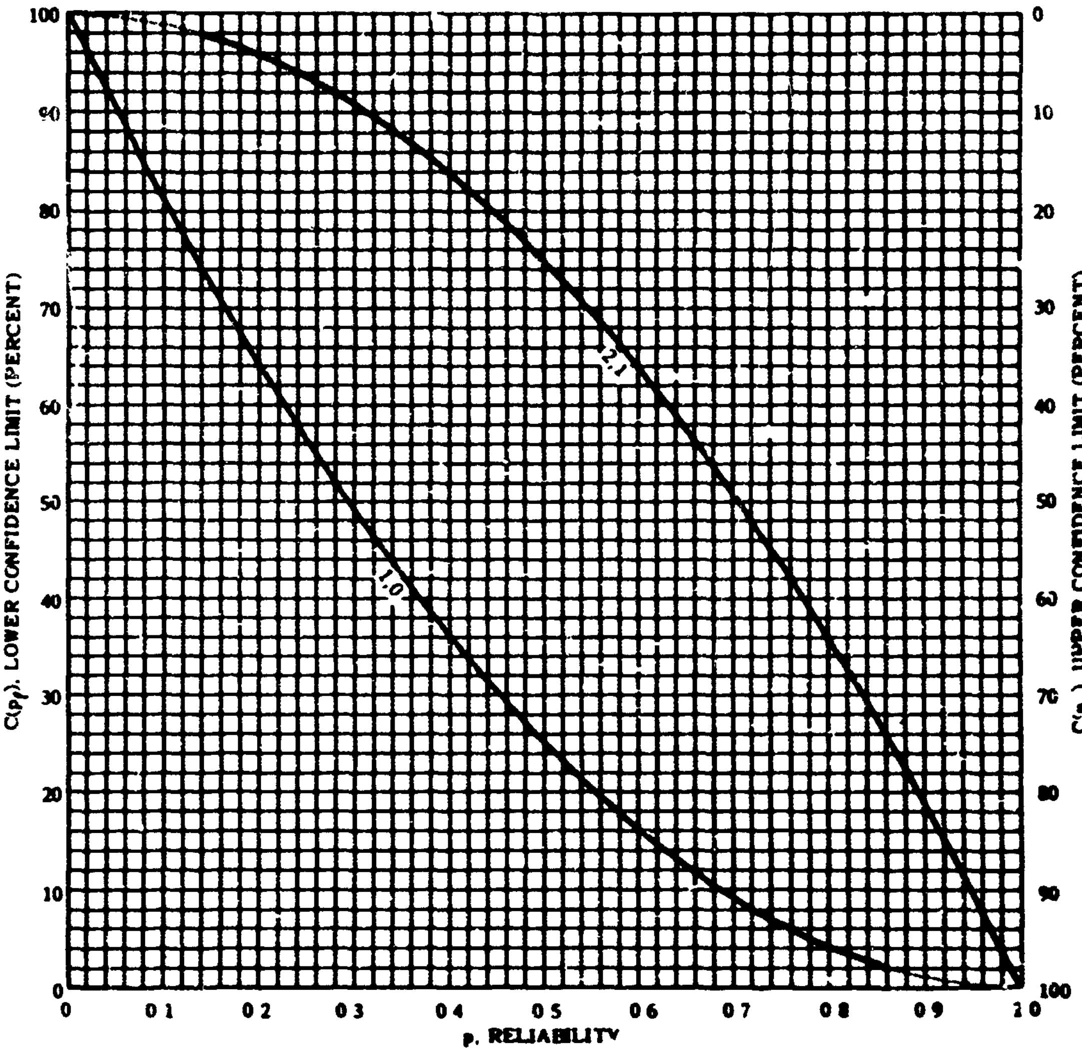
REFERENCES

1. Lieberman, G. J., and D. B. Owen. Tables of Hypergeometric Probability Distribution. Stanford, Calif., Stanford University Press, 1961. (Stanford Studies in Mathematics and Statistics No. 3.)
2. Pieruschka, Erich. Principles of Reliability. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963. Pp. 231-233.
3. Pearson, E. S., and H. O. Hartley. Biometrika Tables for Statisticians. Cambridge, England, Cambridge University Press, 1966. Vol. 1, pp. 83 and 84.



s, (s − 1) = 1,0
(s + 1), s = 1,0
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 1. Reliability Curve for n = 1.



s, (s - 1) = 1,0; 2,1

(s + 1), s = 1,0; 2,1

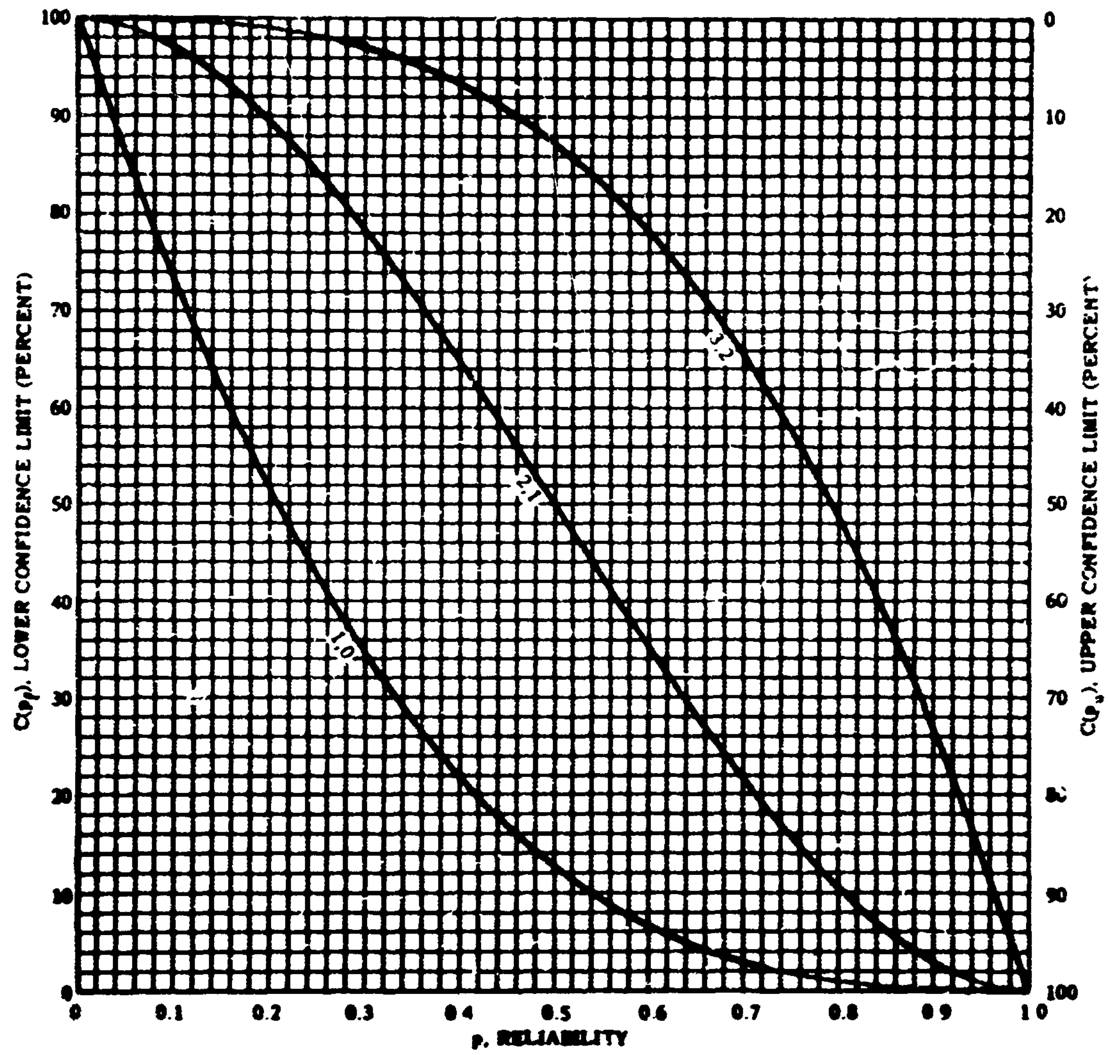
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 2. Reliability Curves for n = 2.



$s, (s - 1) = 1,0;\ 2,1;\ 3,2$

$(s + 1), s = 1,0;\ 2,1;\ 3,2$

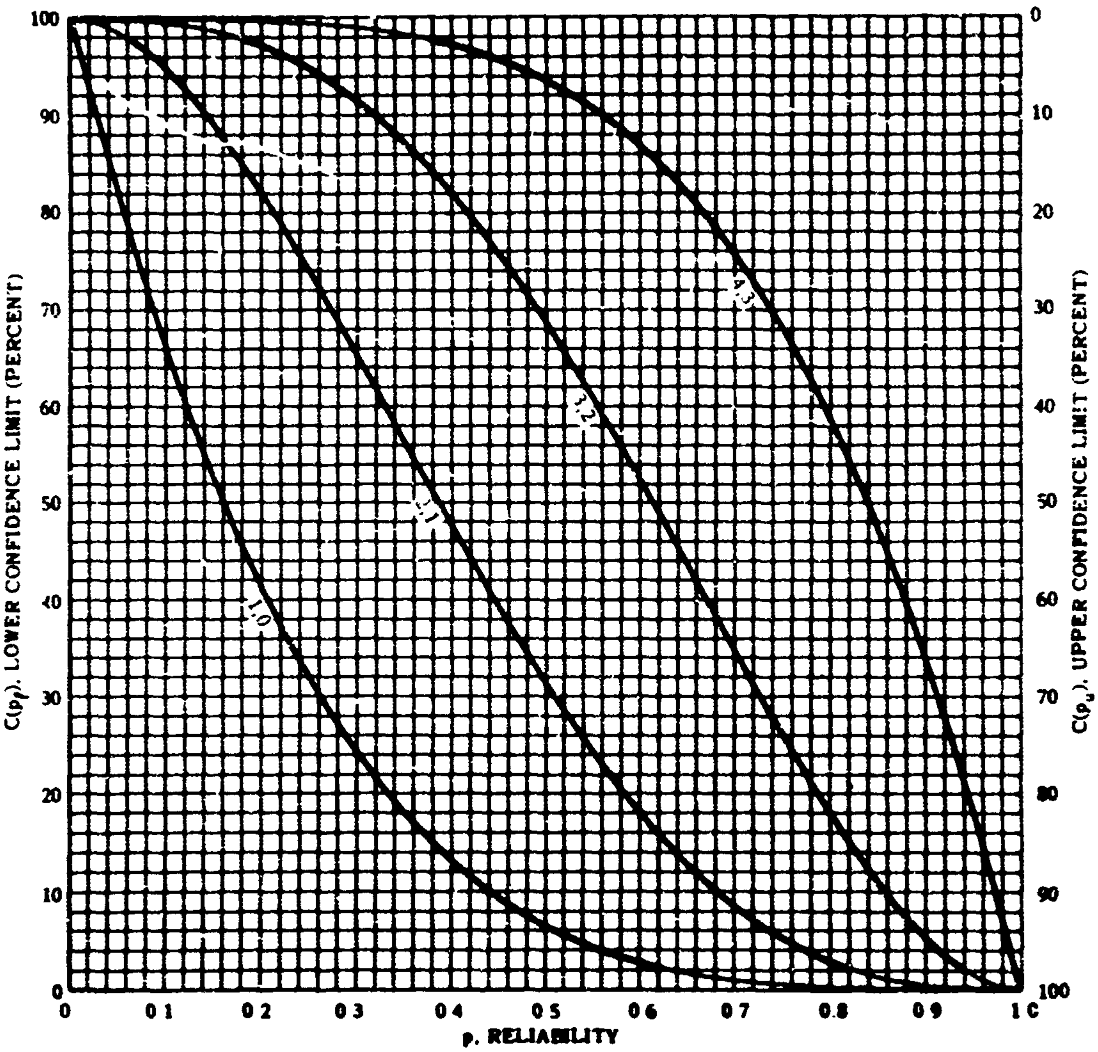
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

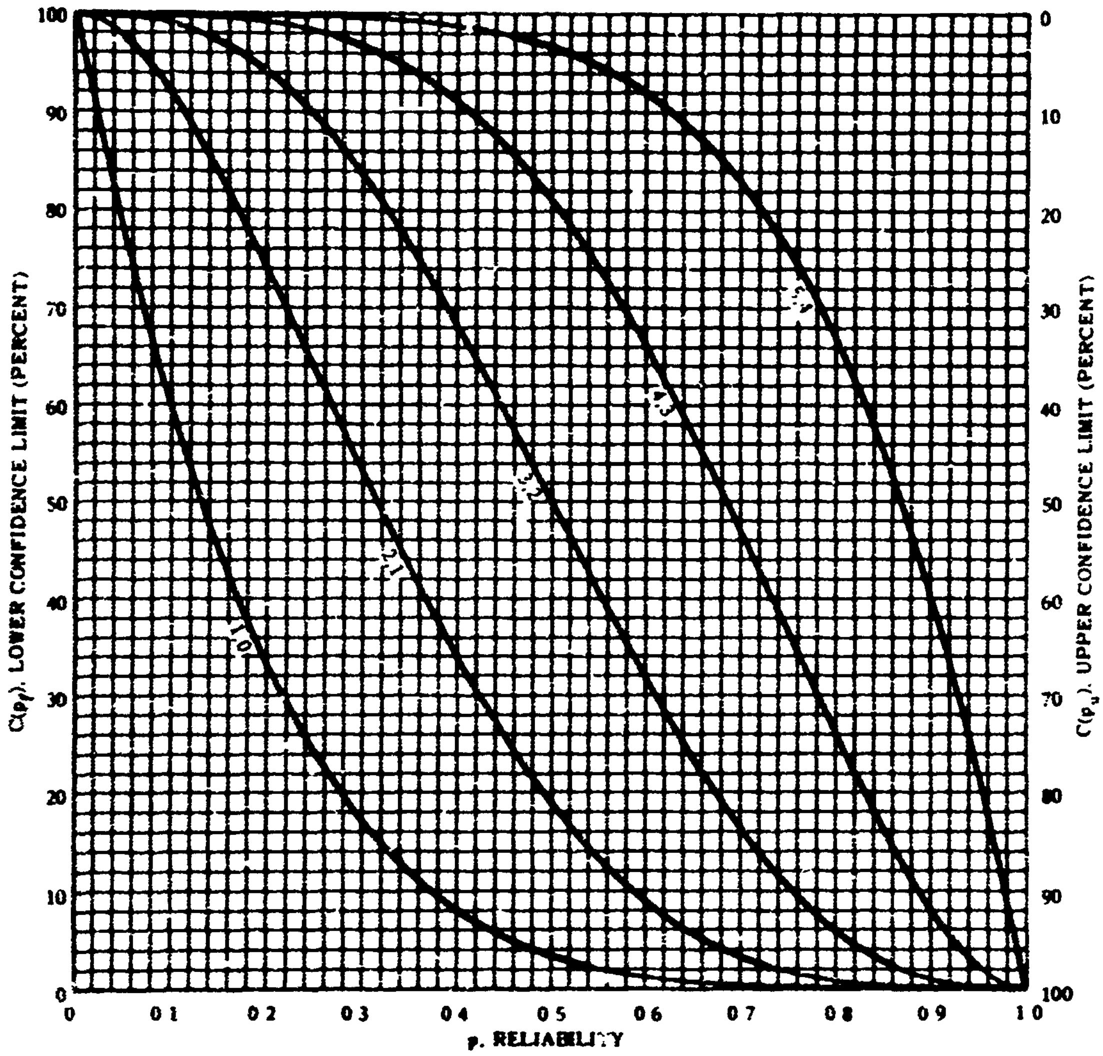
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 3. Reliability Curves for n = 3.



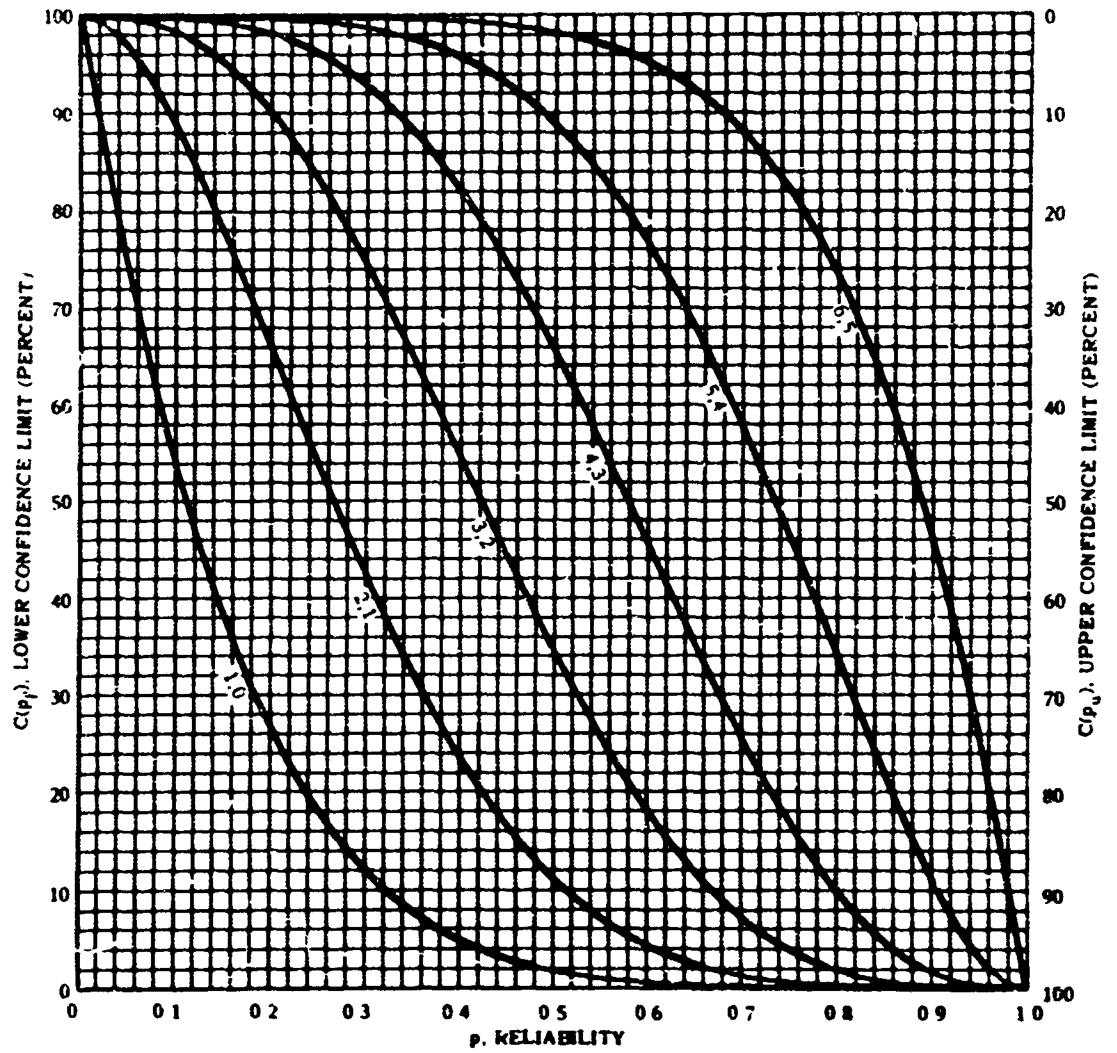
s, (s - 1) = 1,0; 2,1; 3,2; 4,3
(s + 1), s = 1,0; 2,1; 3,2; 4,3
C(p_l) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_l = 1 - C(p_l)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 4. Reliability Curves for n = 4.



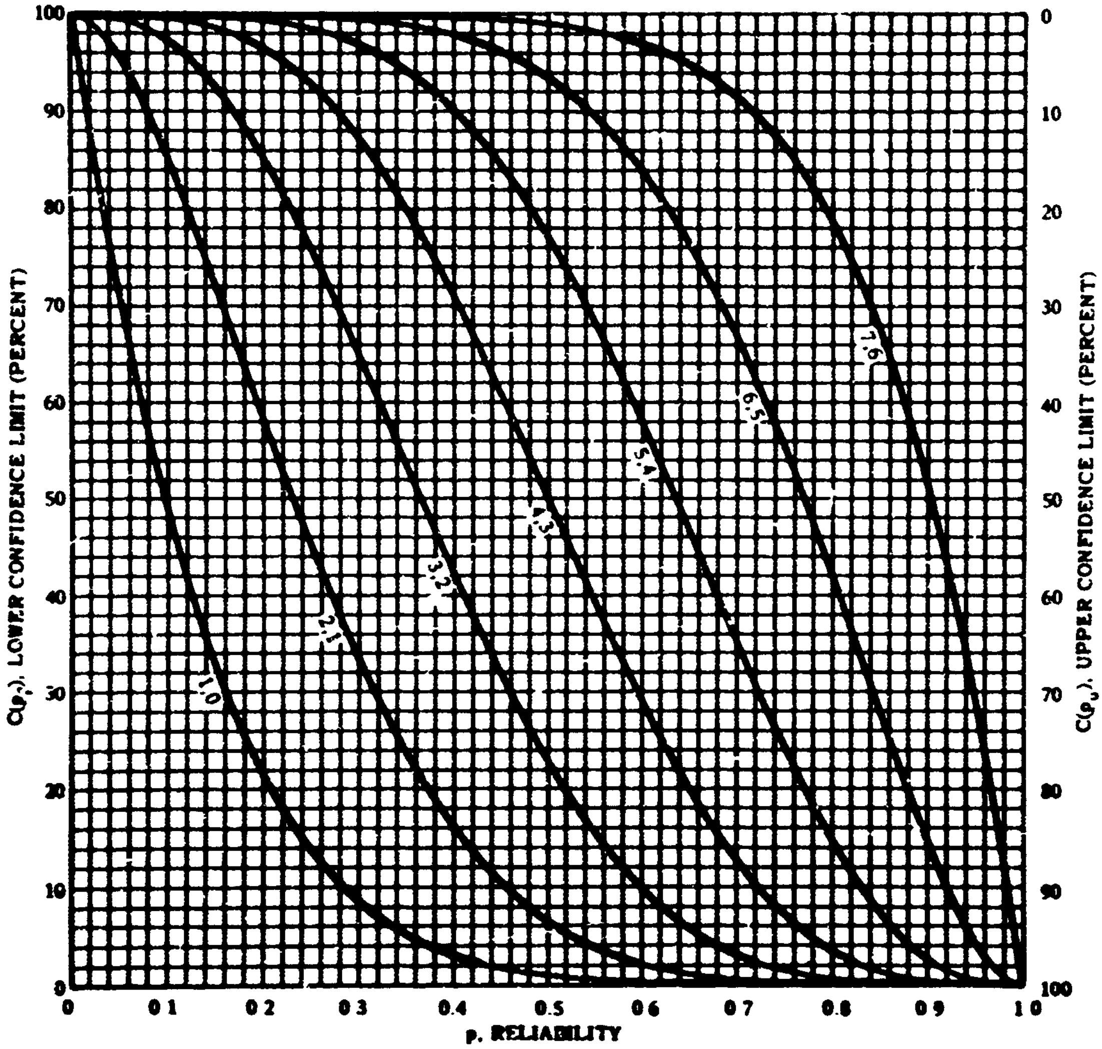
s, (s - 1) = 1,0, 2,1, 3,2; ... ; 5,4
(s + 1), s = 1,0; 2,1, 3,2; ... ; 5,4
$C(p_l)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_l = 1 - $C(p_l)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 5. Reliability Curves for n = .



s, (s - 1) = 1,0, 2,1, 3,2, . . , 6,5
(s + 1), s = 1,0; 2,1, 3,2, . . , 6,5
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 6. Reliability Curves for n = 6.



s, (s - 1) = 1,0; 2,1; 3,2; ...; 7,6

(s + 1), s = 1,0; 2,1; 3,2; ...; 7,6

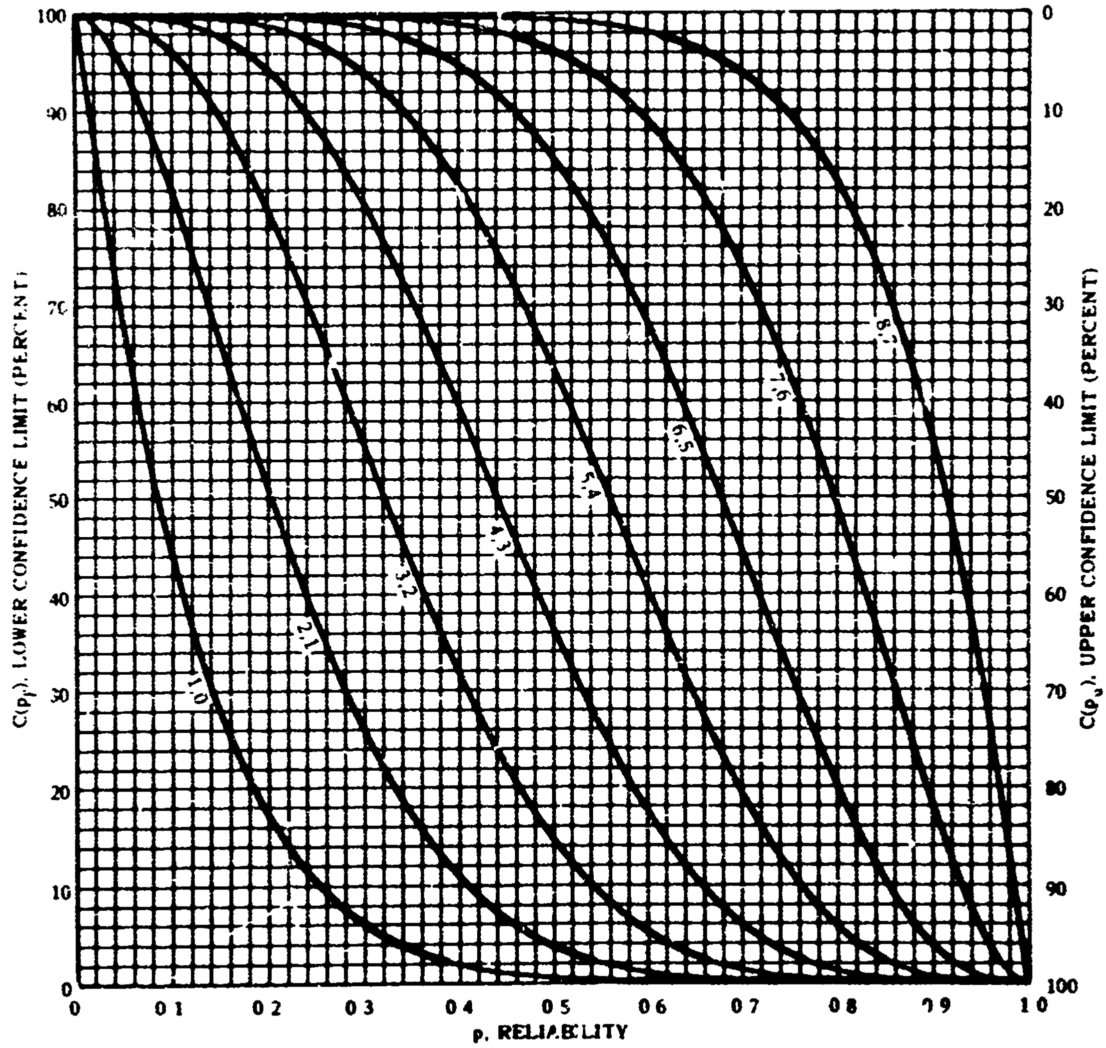
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

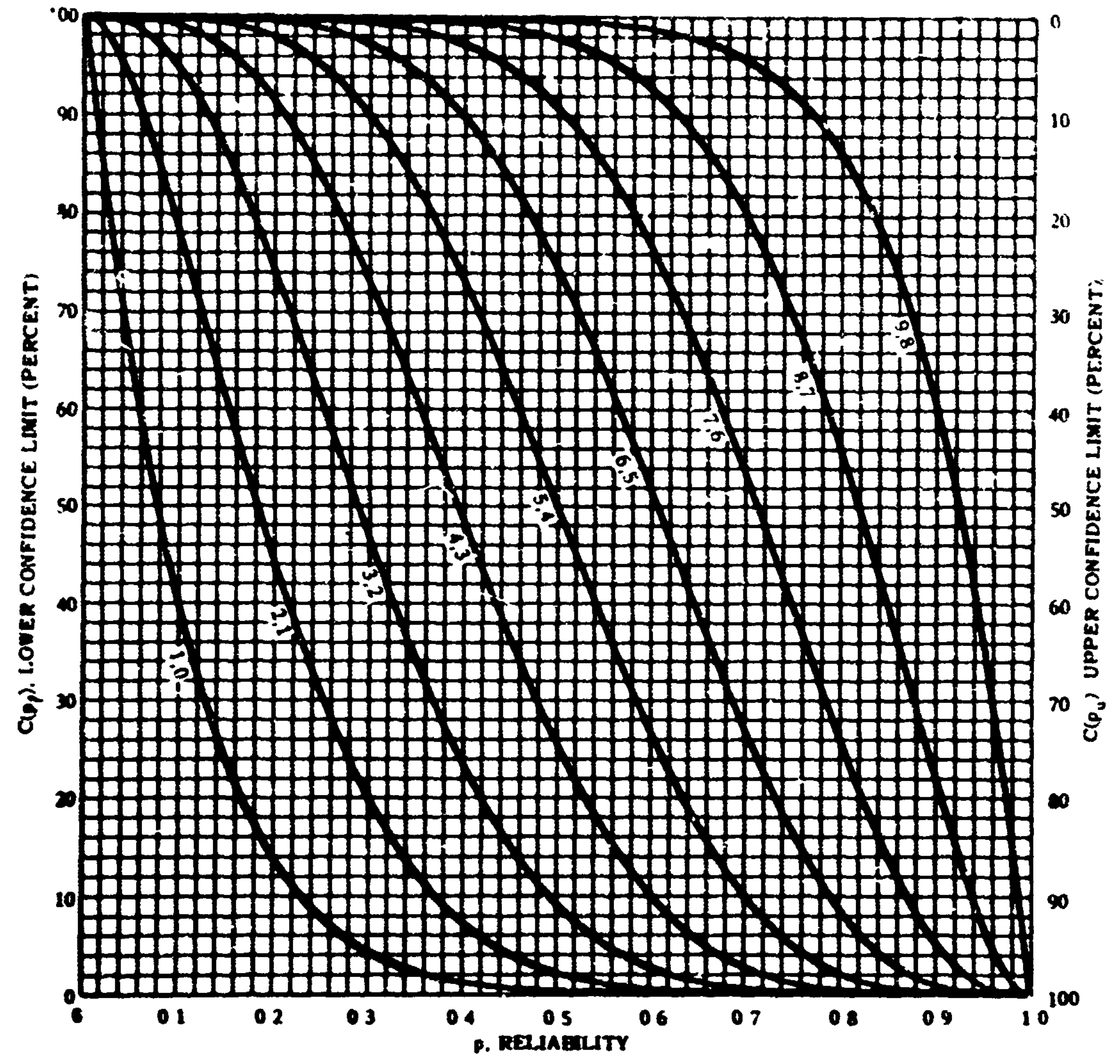
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 7. Reliability Curves for n = 7.



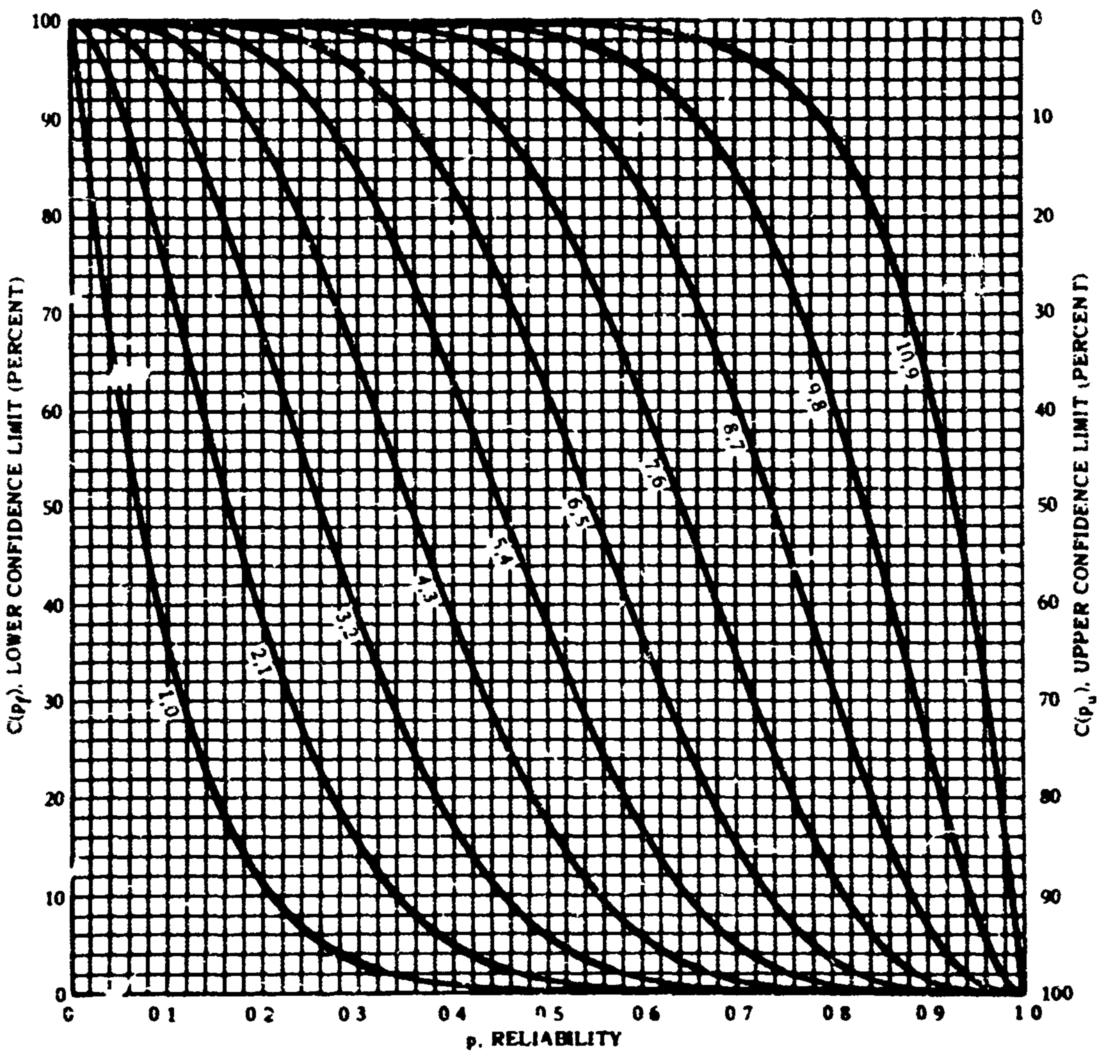
s, (s - 1) = 1,0, 2,1, 3,2; .. ; 8,7
(s + 1), s = 1,0; 2,1, 3,2; .. ; 8,7
$C(p_l)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_l = 1 - C(p_l)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 8. Reliability Curves for n = 8.



s, (s - 1) = 1,0; 2,1; 3,2; ...; 9,8
(s + 1), s = 1,0; 2,1; 3,2; ..., 9,8
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 9. Reliability Curves for n = 9.



s, (s - 1) = 1,0, 2,1, 3,2, . . ; 10,9

(s + 1), s = 1,0; 2,1, 3,2, . . , 10,9

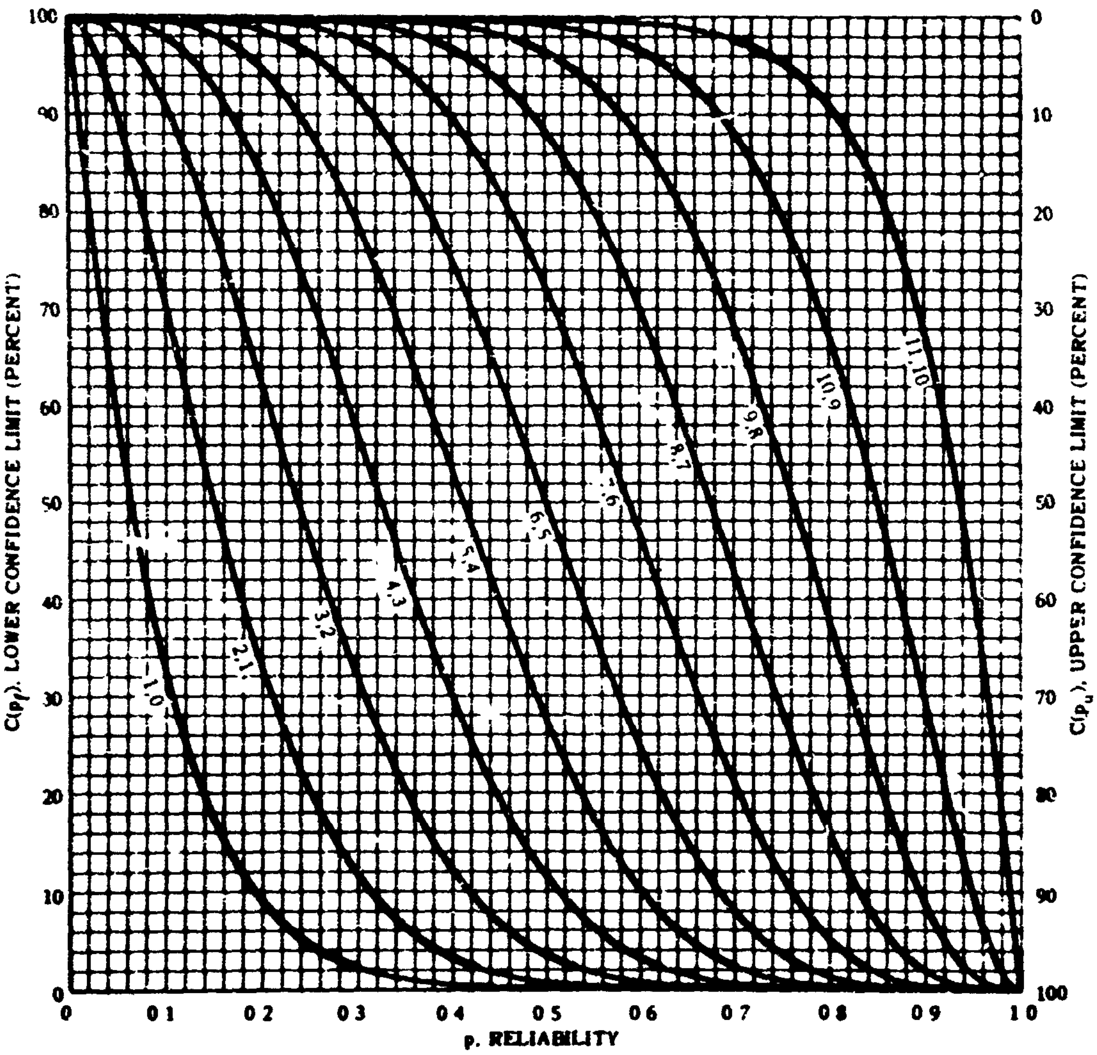
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

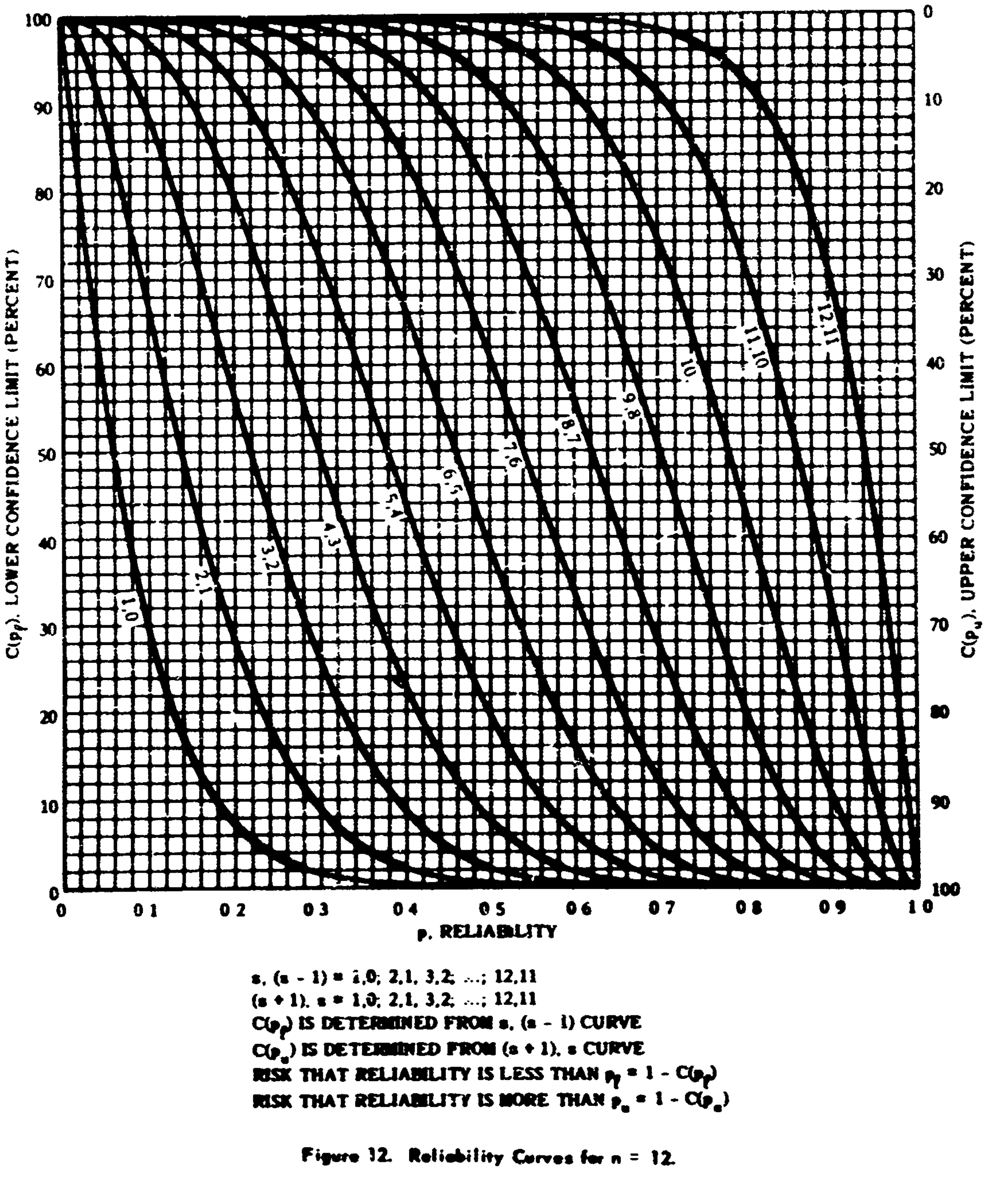
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 10. Reliability Curves for n = 10.



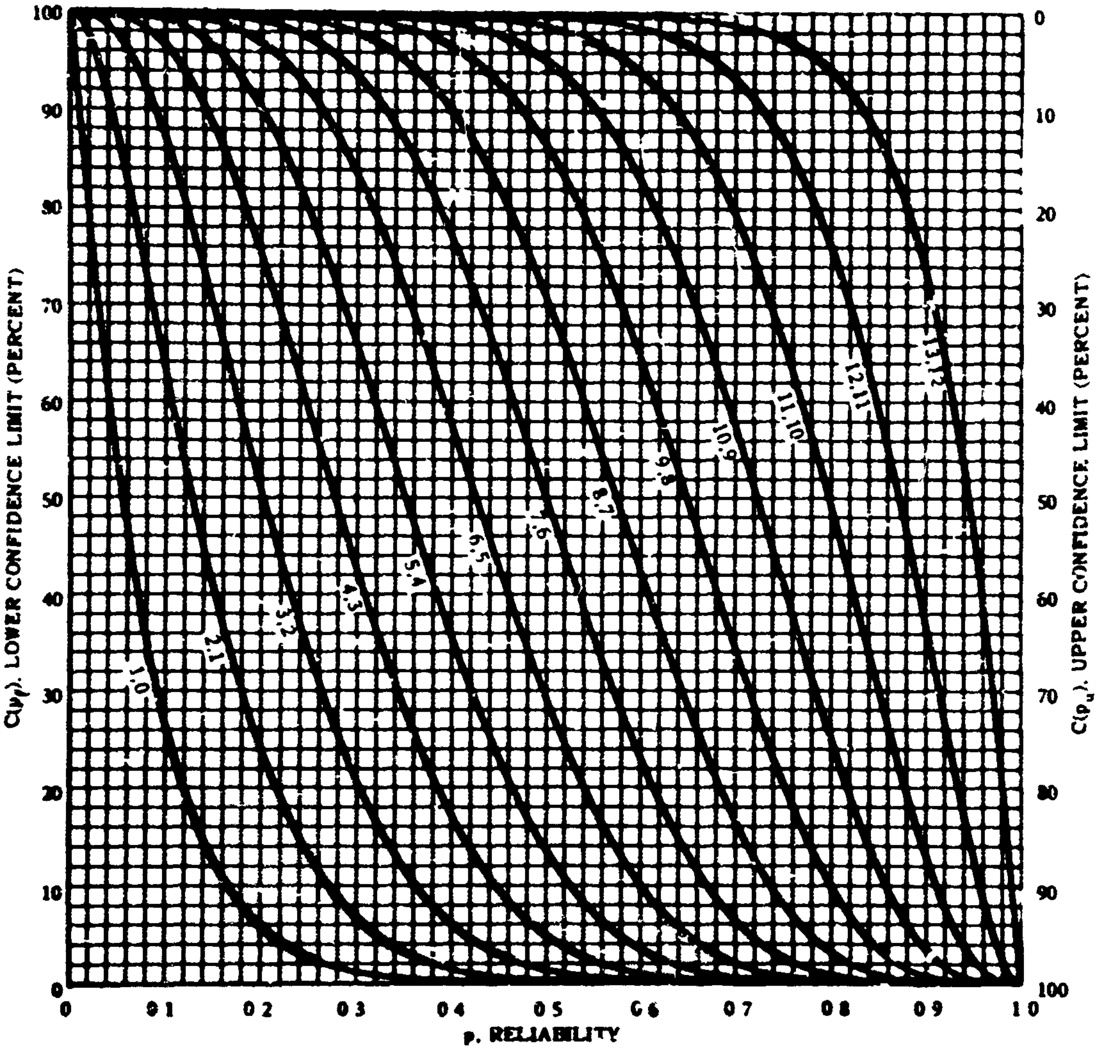
s, (s - 1) = 1,0; 2,1, 3,2; ..., 11,10
(s + 1), s = 1,0; 2,1, 3,2; ...; 11,10
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 11. Reliability Curves for n = 11.



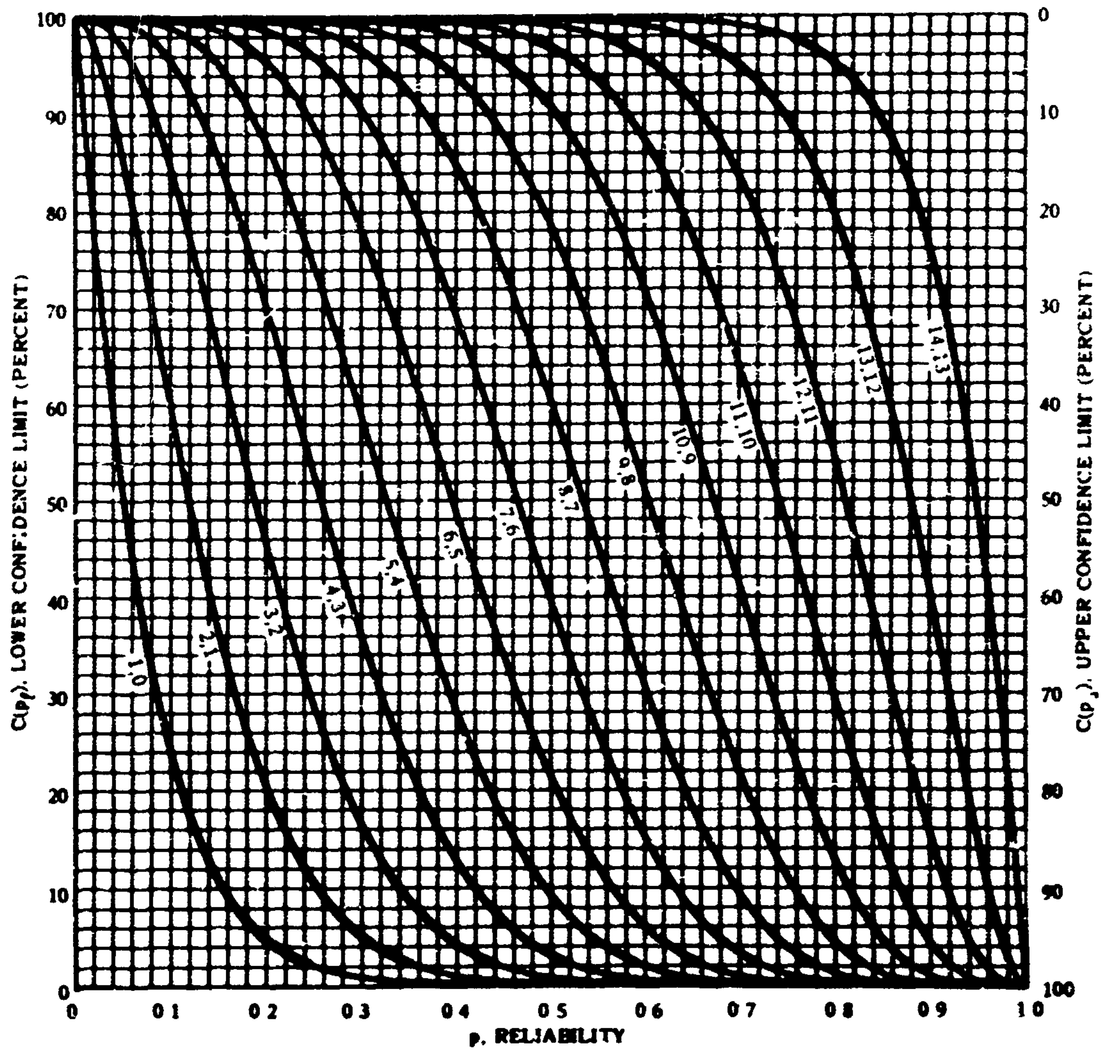
s, (s - 1) = 1,0; 2,1, 3,2; ...; 12,11
(s + 1), s = 1,0; 2,1, 3,2; ...; 12,11
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 12. Reliability Curves for n = 12.



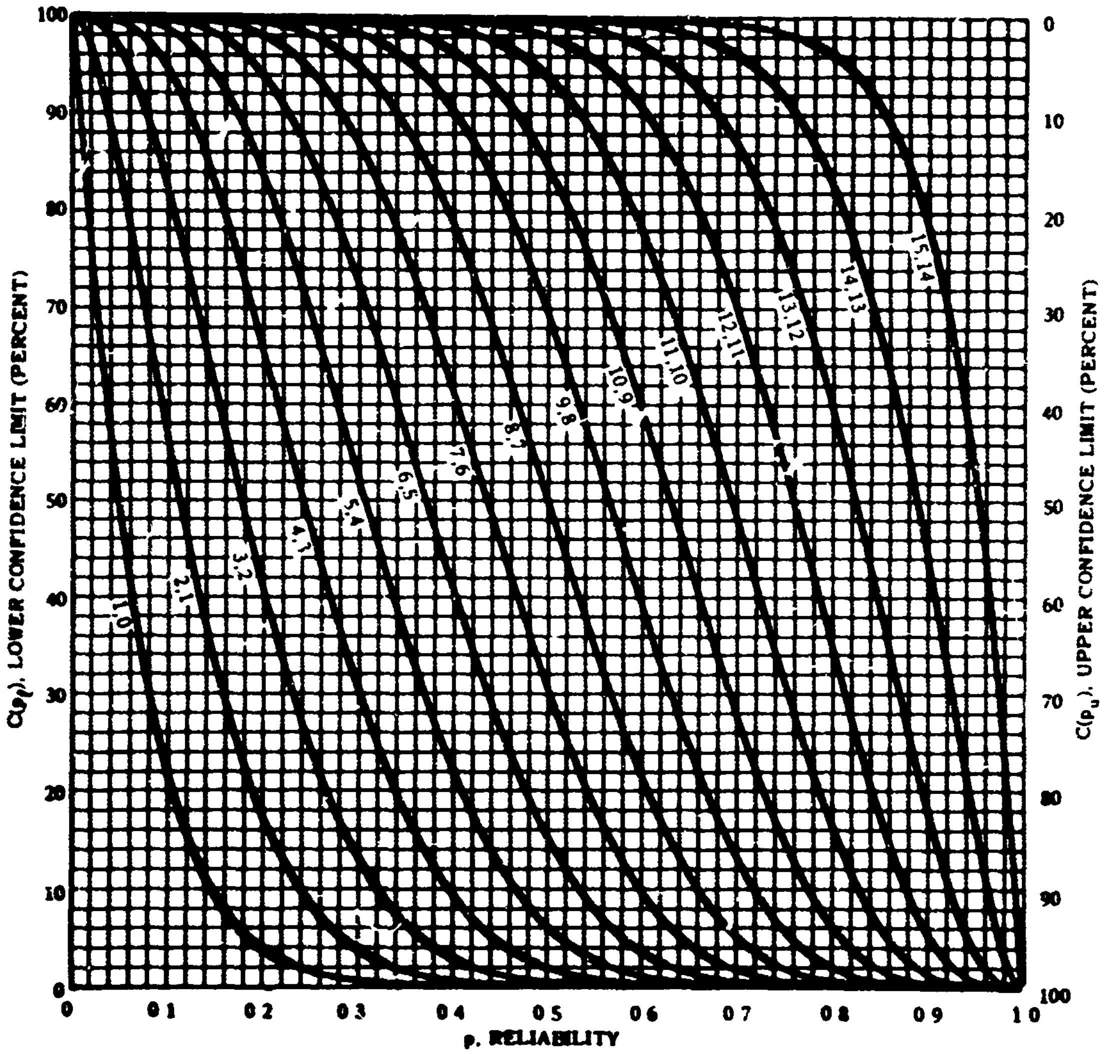
s, (s - 1) = 1,0, 2,1, 3,2, ..., 13,12
(s + 1), s = 1,0; 2,1, 3,2, ...; 13,12
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 13. Reliability Curves for n = 13.



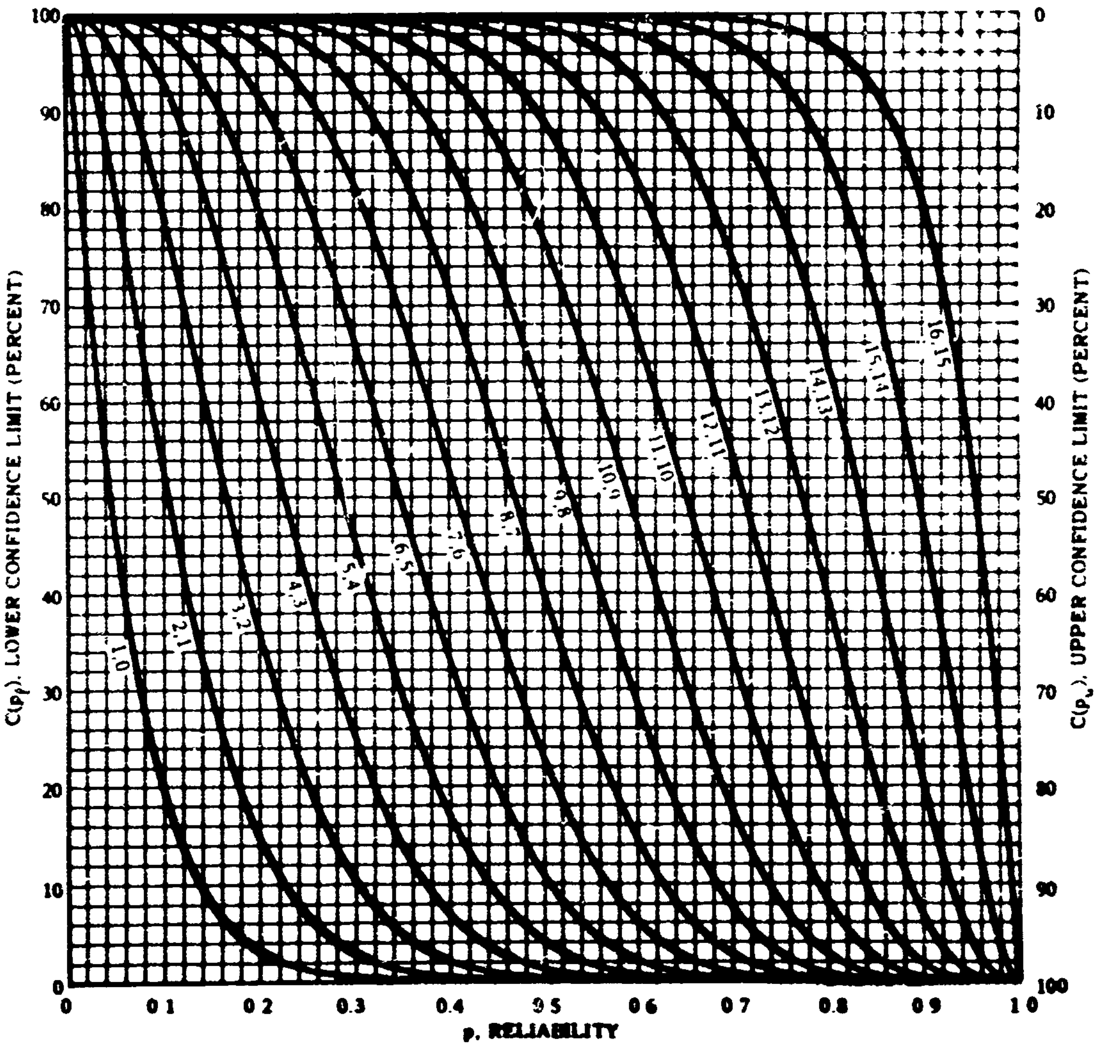
s, (s - 1) = 1,0; 2,1, 3,2; ...; 14,13
(s + 1), s = 1,0; 2,1, 3,2; ...; 14,13
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 14. Reliability Curves for n = 14.



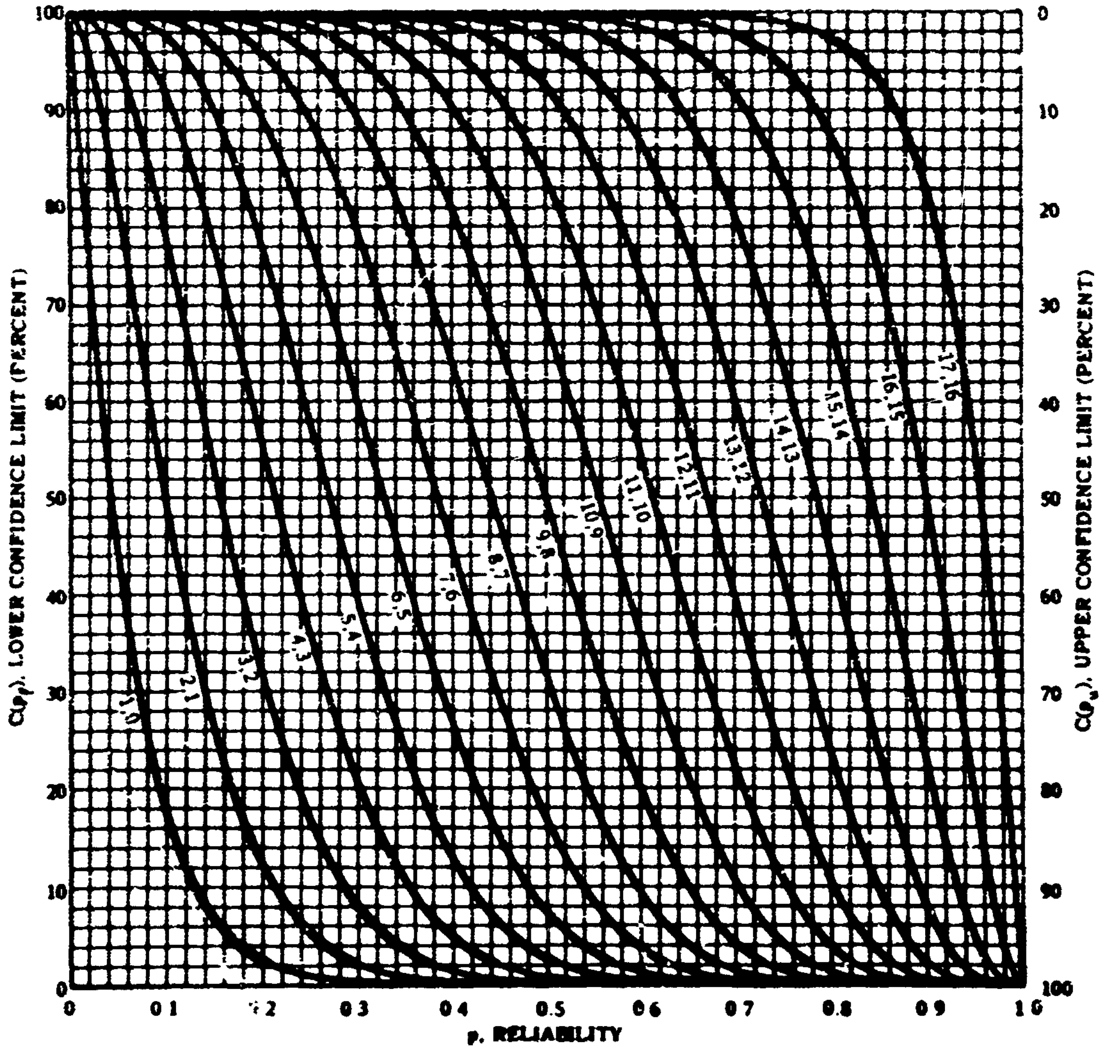
s, (s - 1) = 1,0; 2,1, 3,2; ..., 15,14
(s + 1), s = 1,0; 2,1; 3,2; ...; 15,14
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 15. Reliability Curves for n = 15.



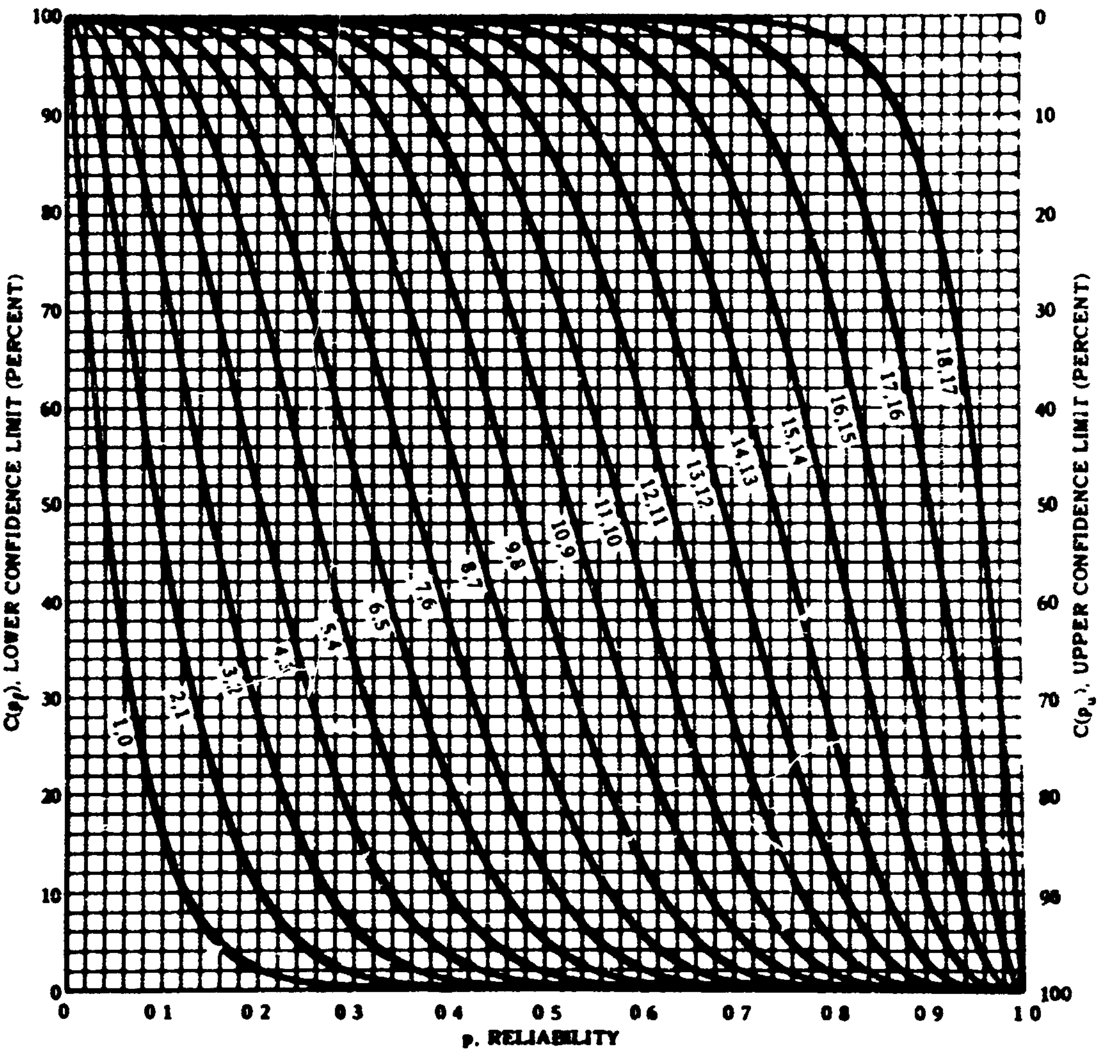
s, (s - 1) = 1,0; 2,1; 3,2; ...; 16,15
(s + 1), s = 1,0; 2,1; 3,2; ...; 16,15
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 16. Reliability Curves for n = 16.



s, (s - 1) = 1,0; 2,1; 3,2; ...; 17,16
(s + 1), s = 1,0; 2,1, 3,2; ...; 17,16
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 17. Reliability Curves for n = 17.



s, (s - 1) = 1,0; 2,1, 3,2; ...; 18,17

(s + 1), s = 1,0; 2,1, 3,2, ...; 18,17

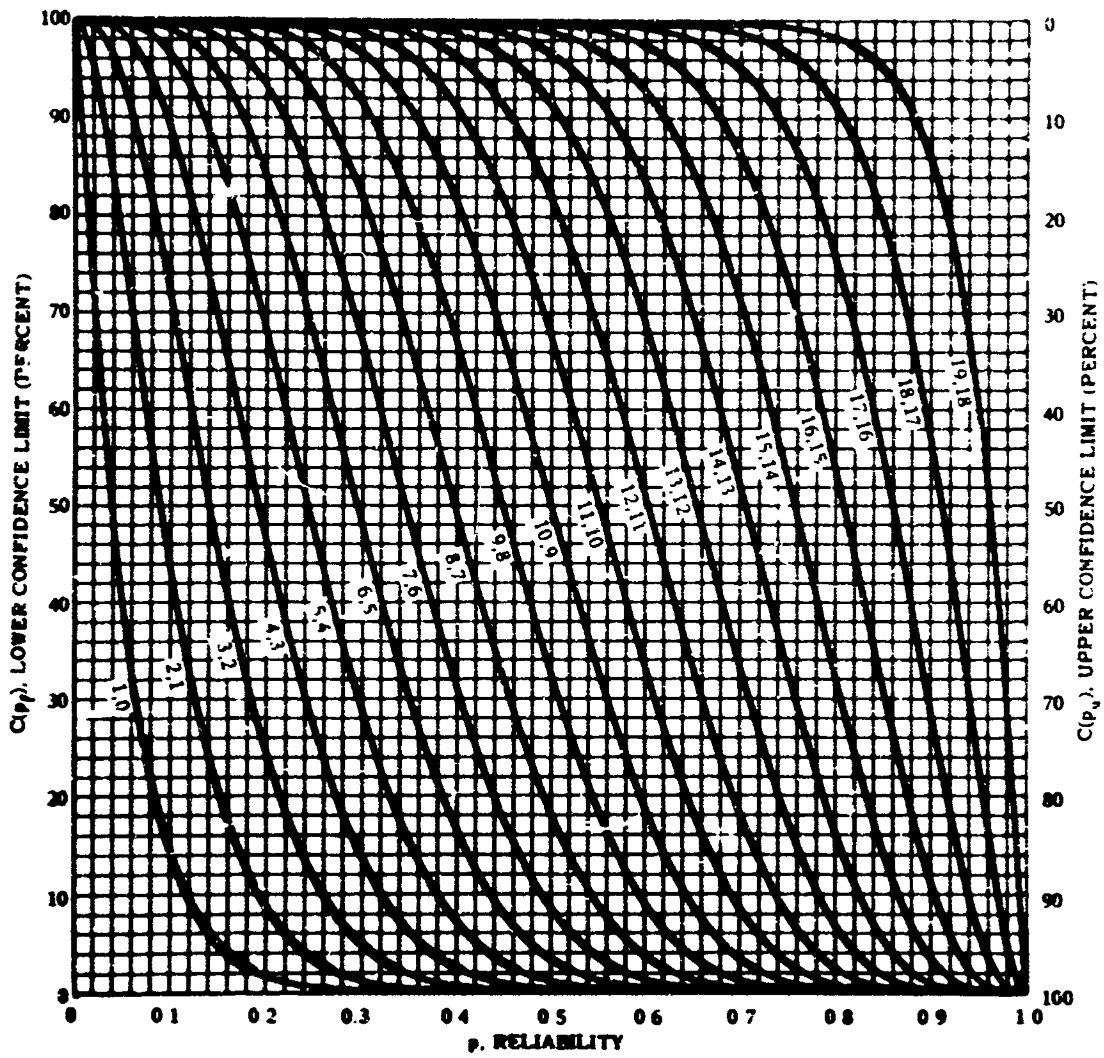
$C(p_l)$ IS DETERMINED FROM s, (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_l = 1 - C(p_l)$

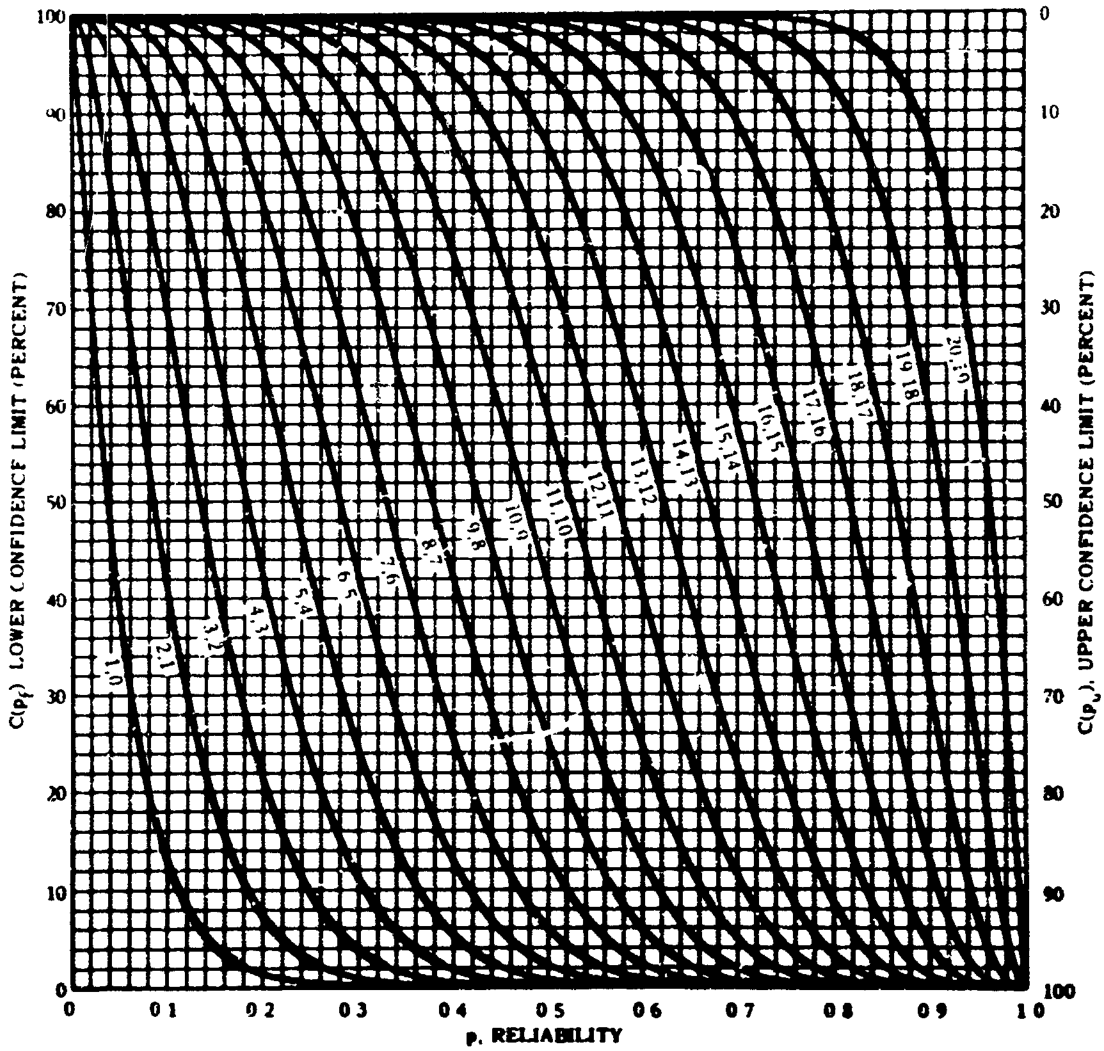
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 18. Reliability Curves for n = 18.



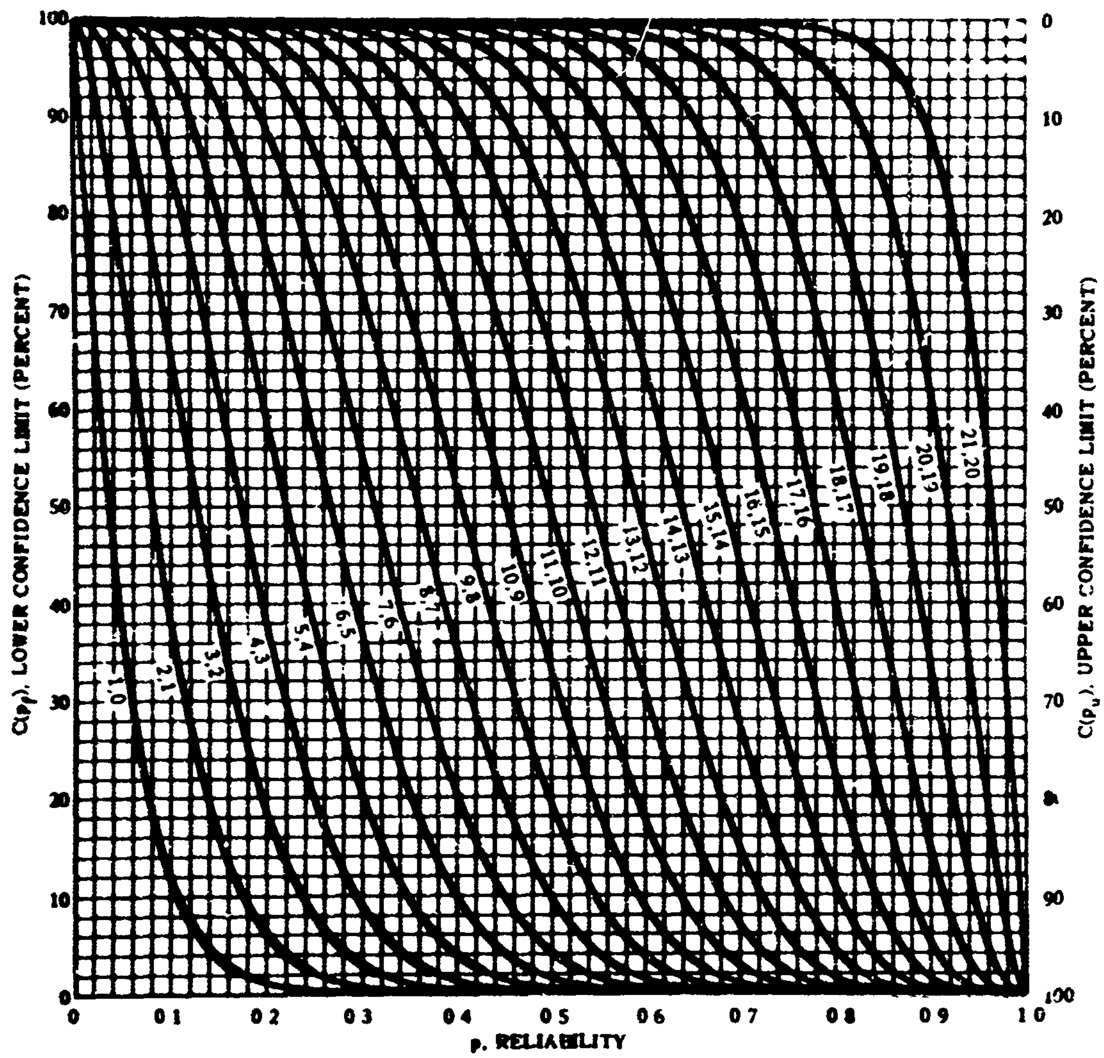
s, (s - 1) = 1,0; 2,1; 3,2; ...; 19,18
(s + 1), s = 1,0; 2,1; 3,2; ...; 19,18
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 19. Reliability Curves for n = 19.



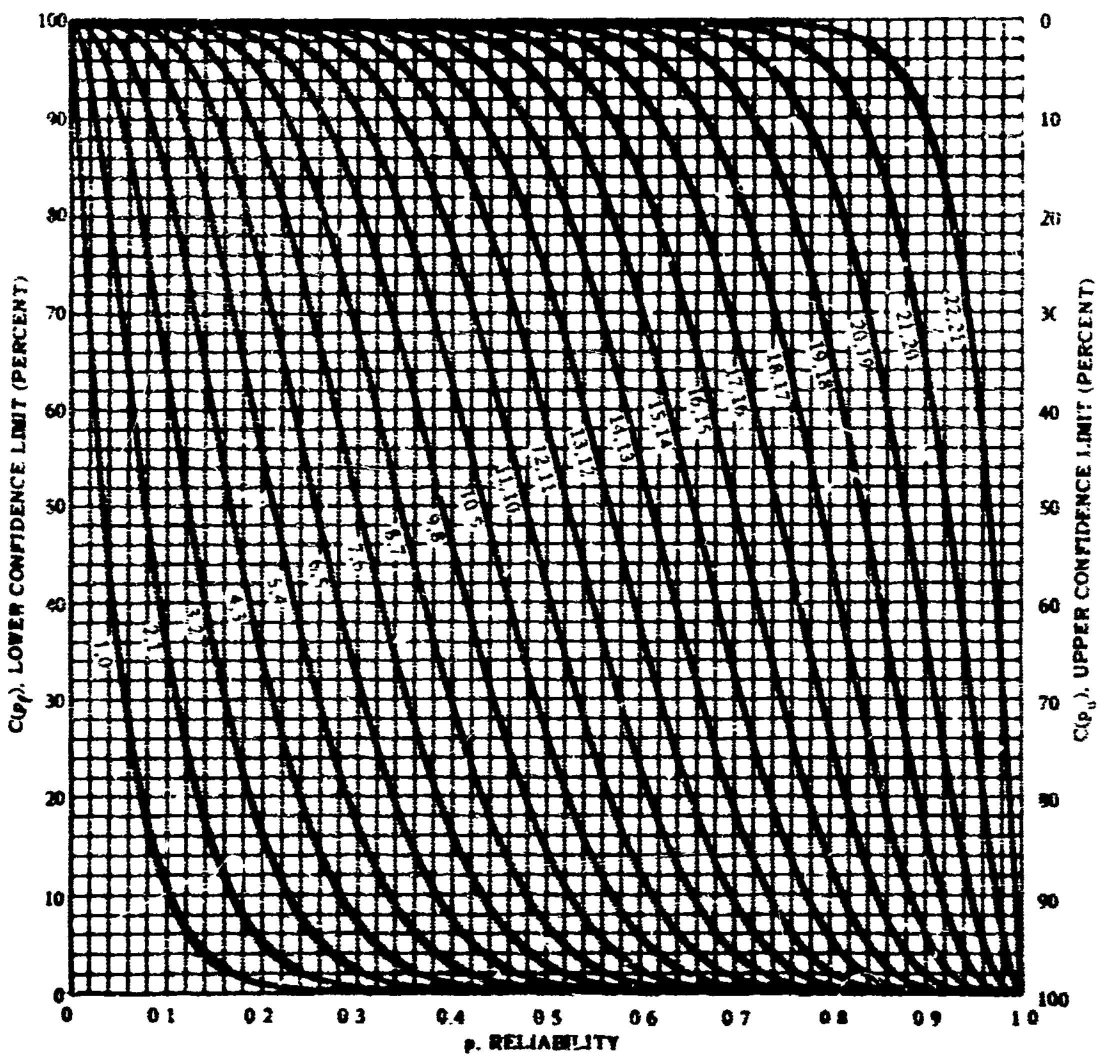
s, (s - 1) = 1,0; 2,1; 3,2; ... ; 20,19
(s + 1), s = 1,0; 2,1; 3,2; ...; 20,19
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 20. Reliability Curves for n = 20.



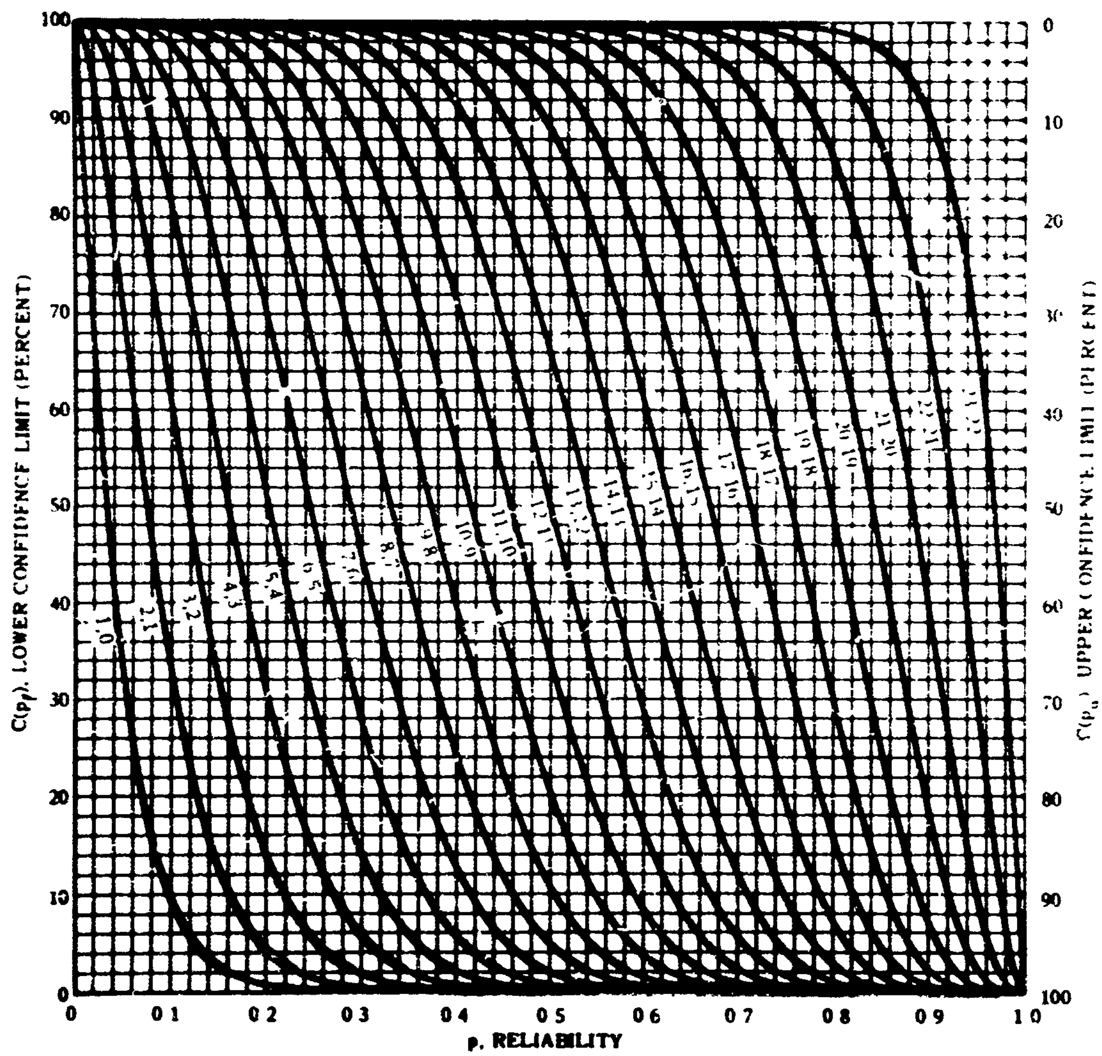
s, (s - 1) = 1,0; 2,1; 3,2; ...; 21,20
(s + 1), s = 1,0; 2,1; 3,2; ...; 21,20
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 21. Reliability Curves for n = 21.



s, (s - 1) = 1,0; 2,1; 3,2; ..., 22,21
(s + 1), s = 1,0; 2,1; 3,2; ..., 22,21
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 22. Reliability Curves for n = 32.



$s, (s - 1) = 1,0; 2,1, 3,2; \ldots, 23,22$

$(s + 1), s = 1,0; 2,1, 3,2; \ldots; 23,22$

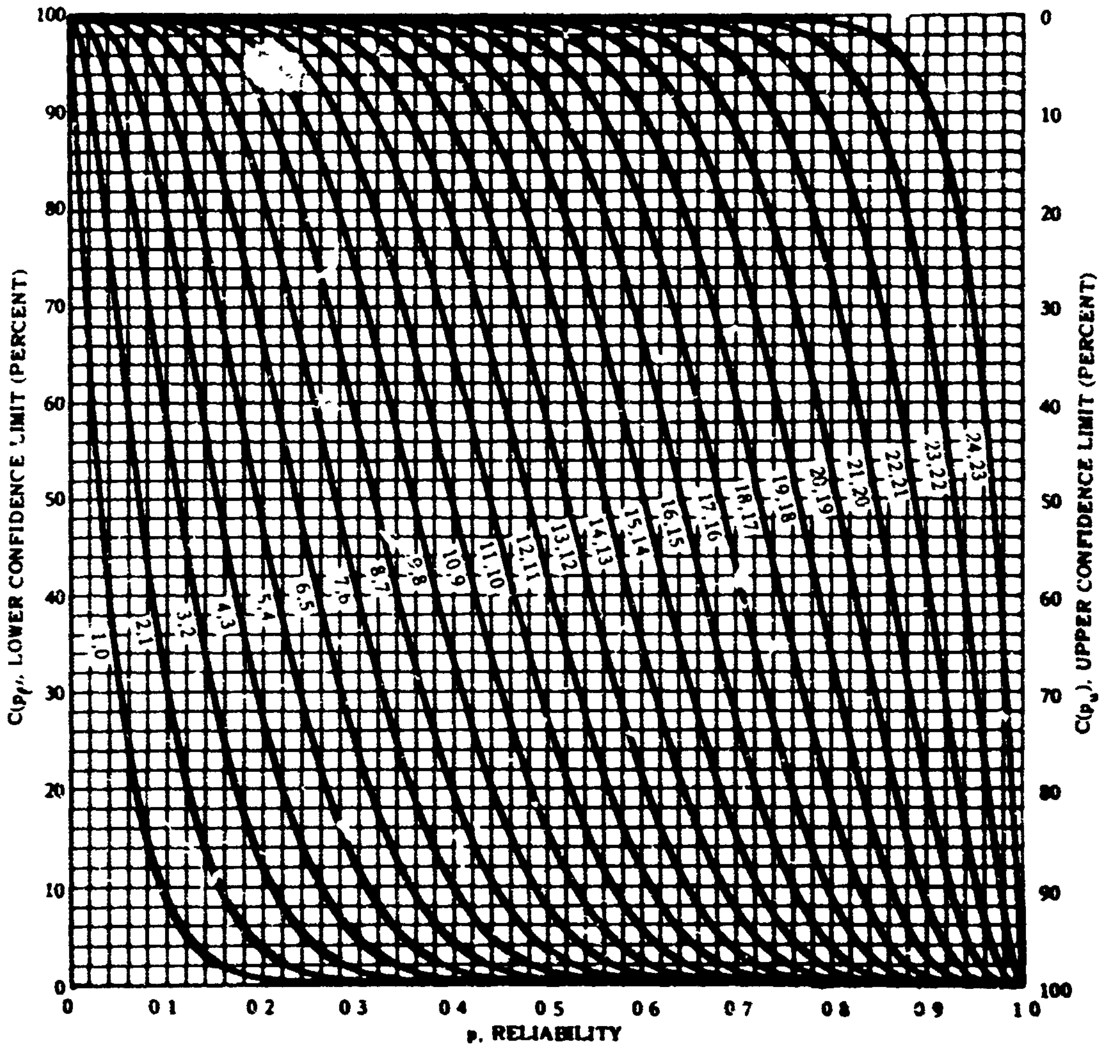
$C(p_\ell)$ IS DETERMINED FROM $s, (s - 1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s + 1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

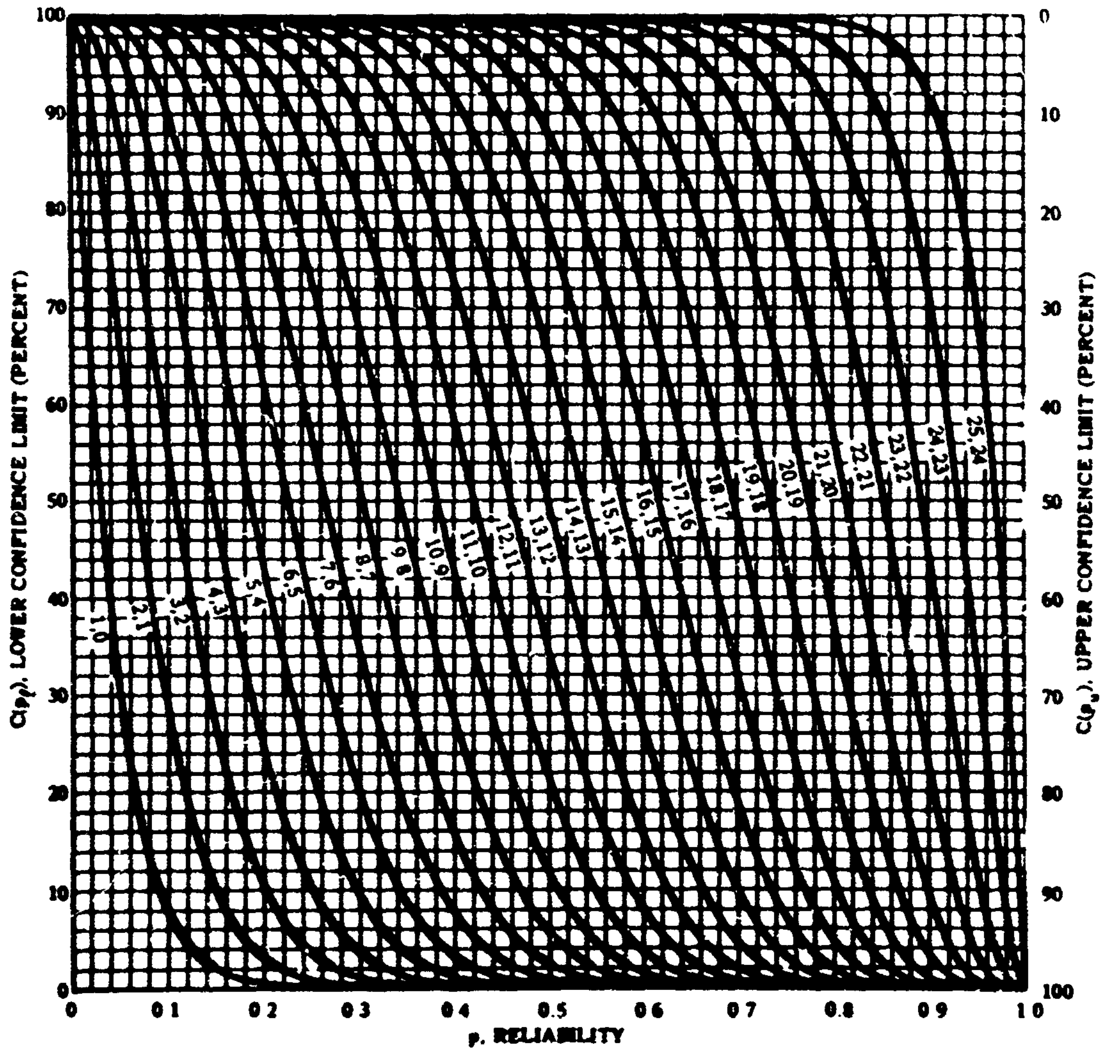
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 23. Reliability Curves for n = 23.



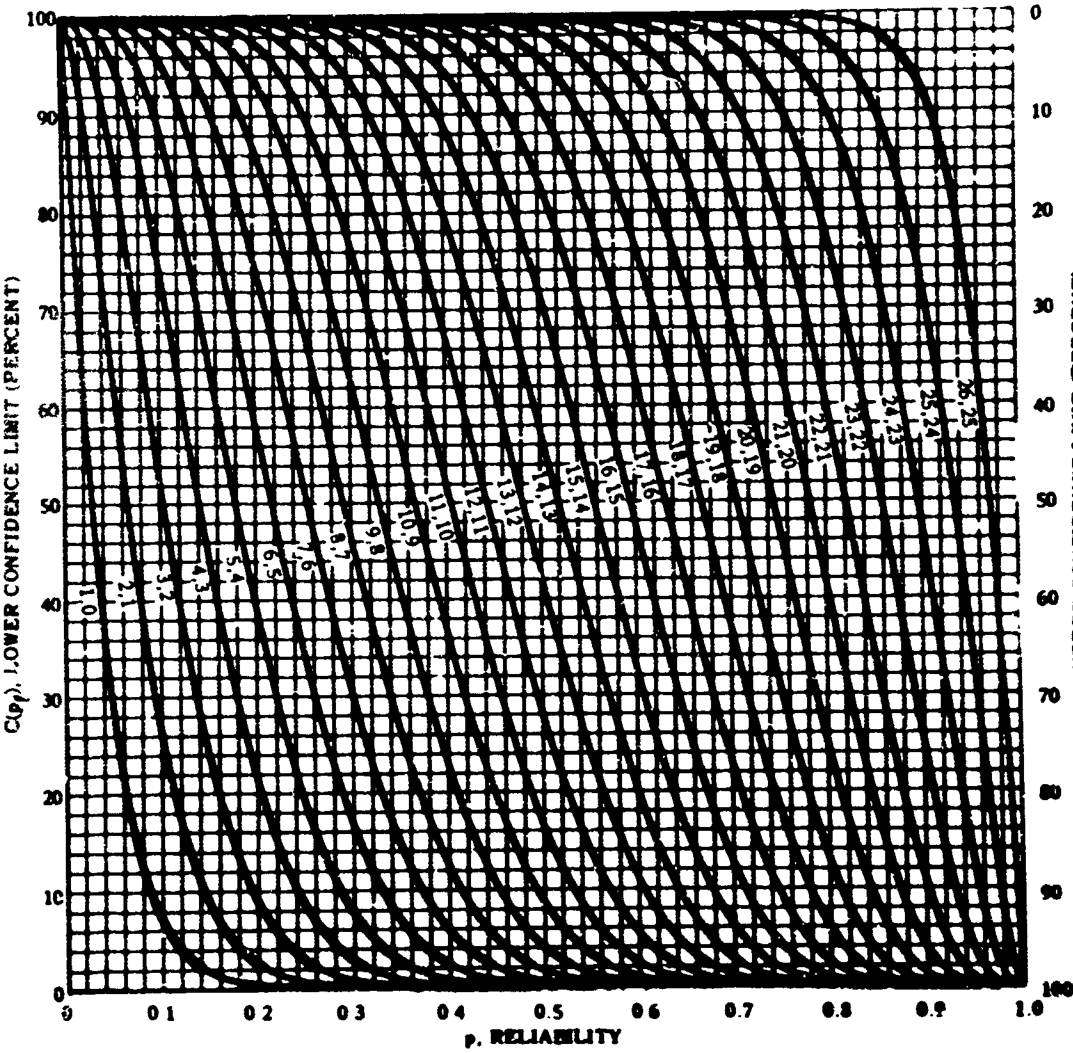
s, (s - 1) = 1,0; 2,1, 3,2; ; 24,23
(s + 1), s = 1,0; 2,1, 3,2, , 24,23
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 24. Reliability Curves for n = 24.



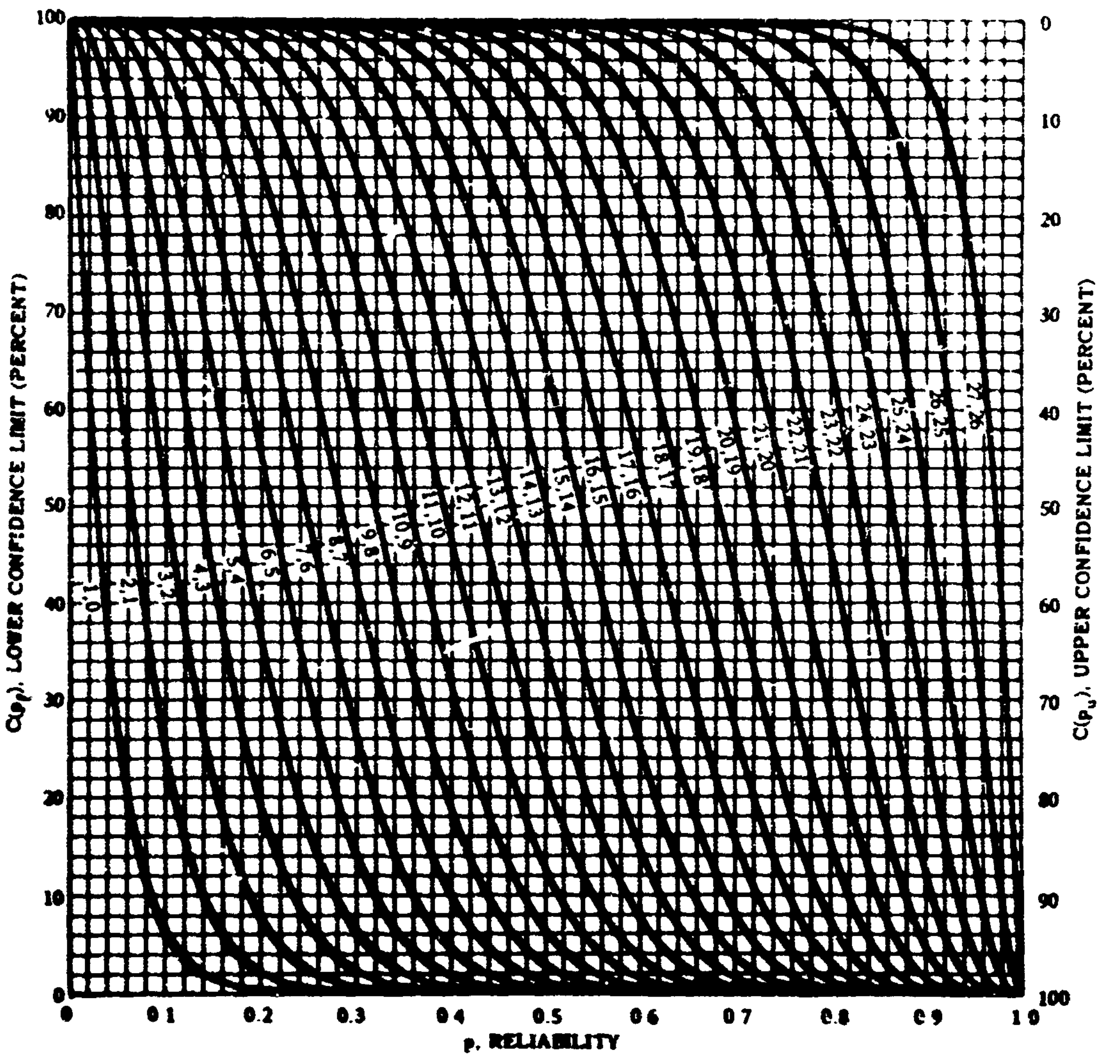
s, (s - 1) = 1,0; 2,1; 3,2; ... ; 25,24
(s + 1), s = 1,0; 2,1, 3,2; ...; 25,24
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 25. Reliability Curves for $n = 25$.



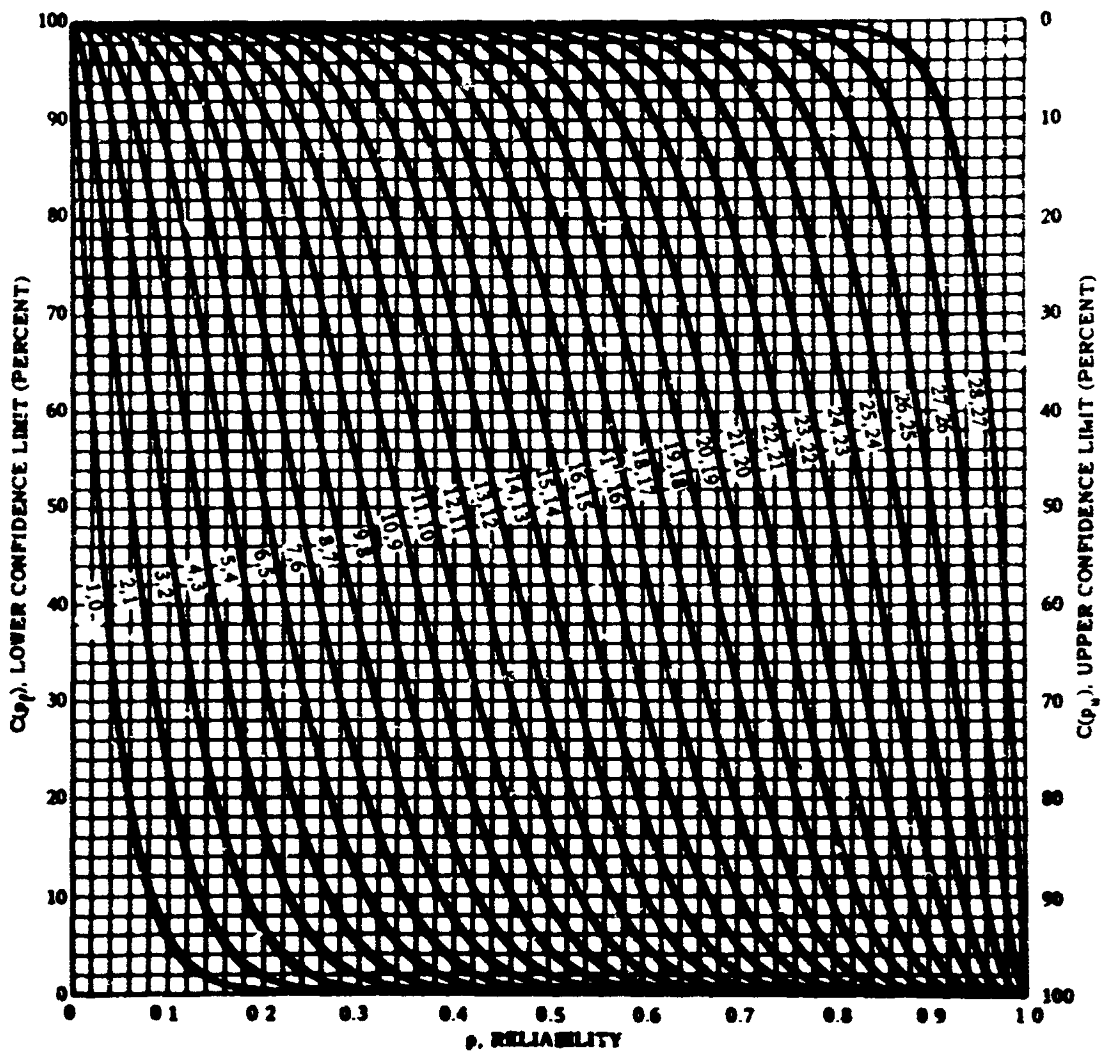
s, (s - 1) = 1,0; 2,1, 3,2; ...; 26,25
(s + 1), s = 1,0; 2,1, 3,2; ...; 26,25
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 26. Reliability Curves for n = 26.



s, (s - 1) = 1,0; 2,1; 3,2; ...; 27,26
(s + 1), s = 1,0; 2,1; 3,2; ...; 27,26
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 27. Reliability Curves for n = 27.



$s, (s-1) = 1,0;\ 2,1;\ 3,2;\ \ldots;\ 28,27$

$(s+1), s = 1,0;\ 2,1,\ 3,2;\ \ldots;\ 28,27$

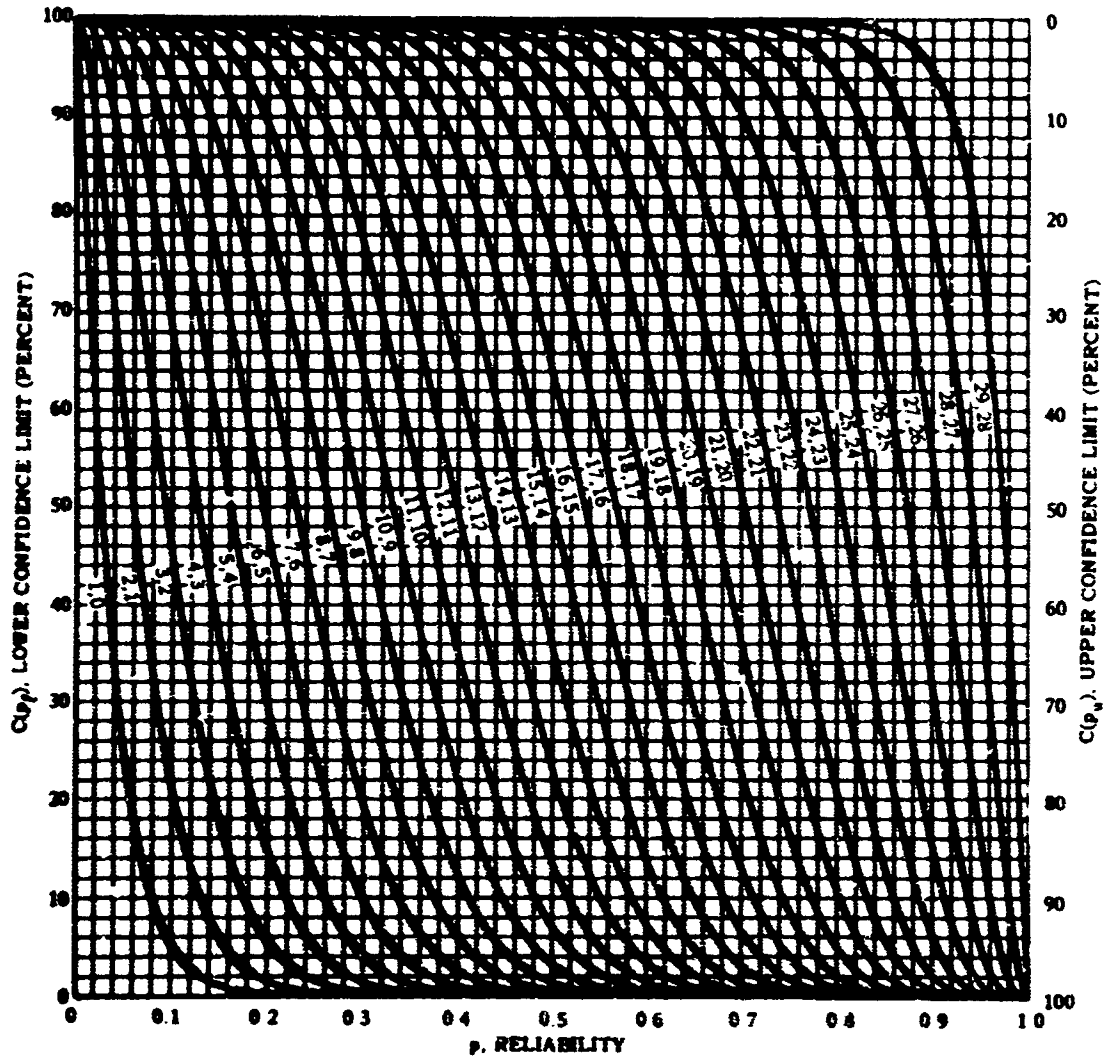
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

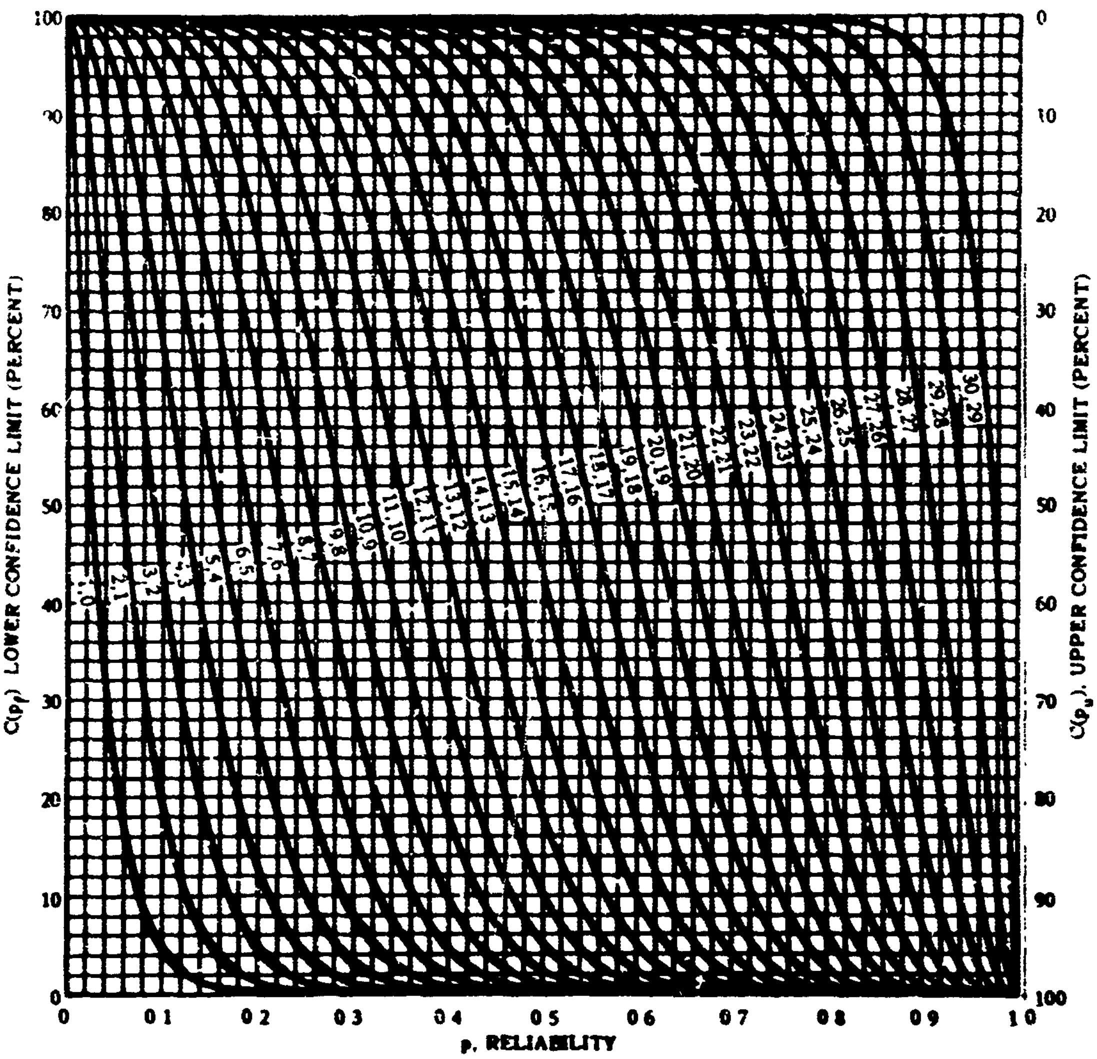
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 28. Reliability Curves for n = 28.



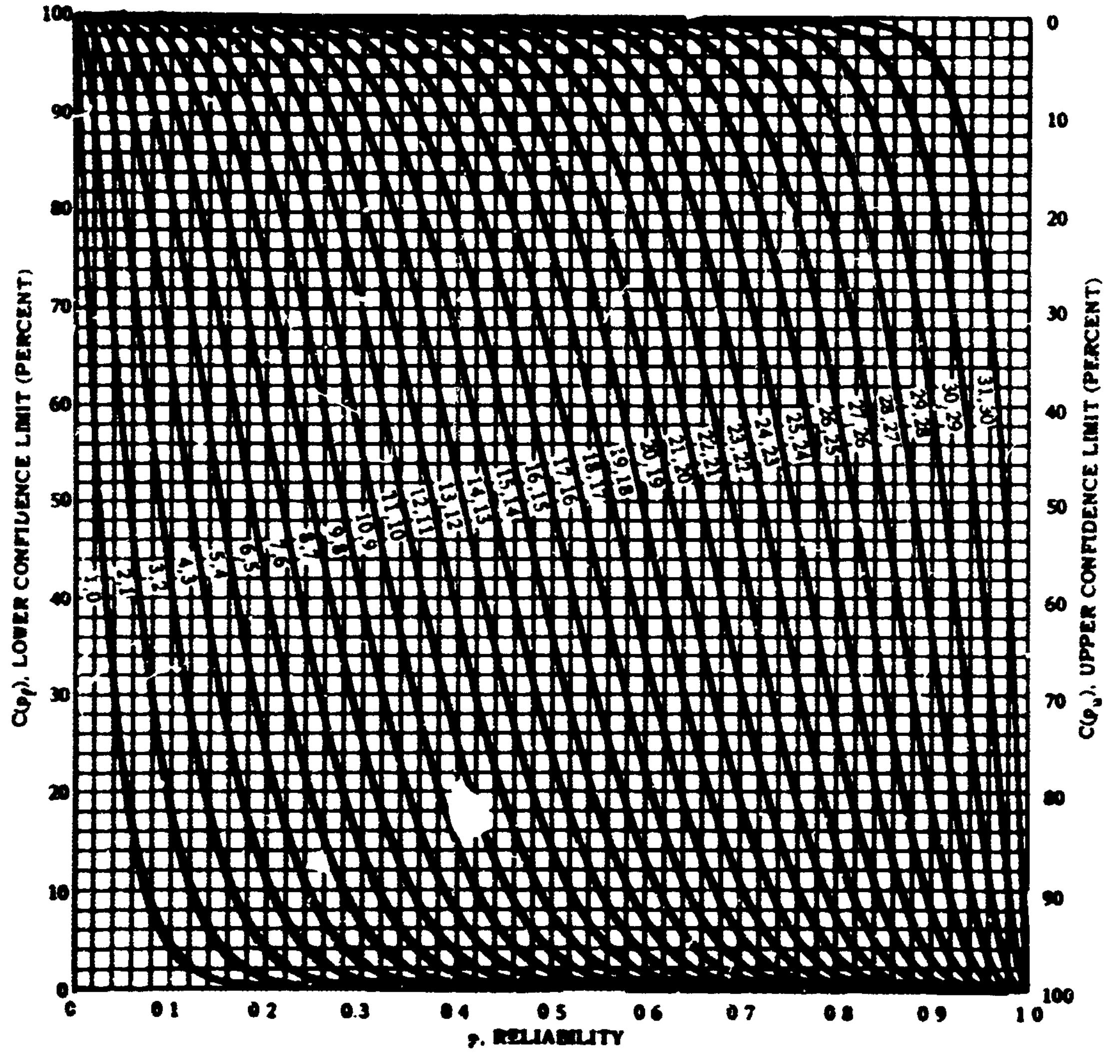
s, (s - 1) = 1,0; 2,1; 3,2; ... ; 29,28
(s + 1), s = 1,0; 2,1; 3,2; ... ; 29,28
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 29. Reliability Curves for r = 29.



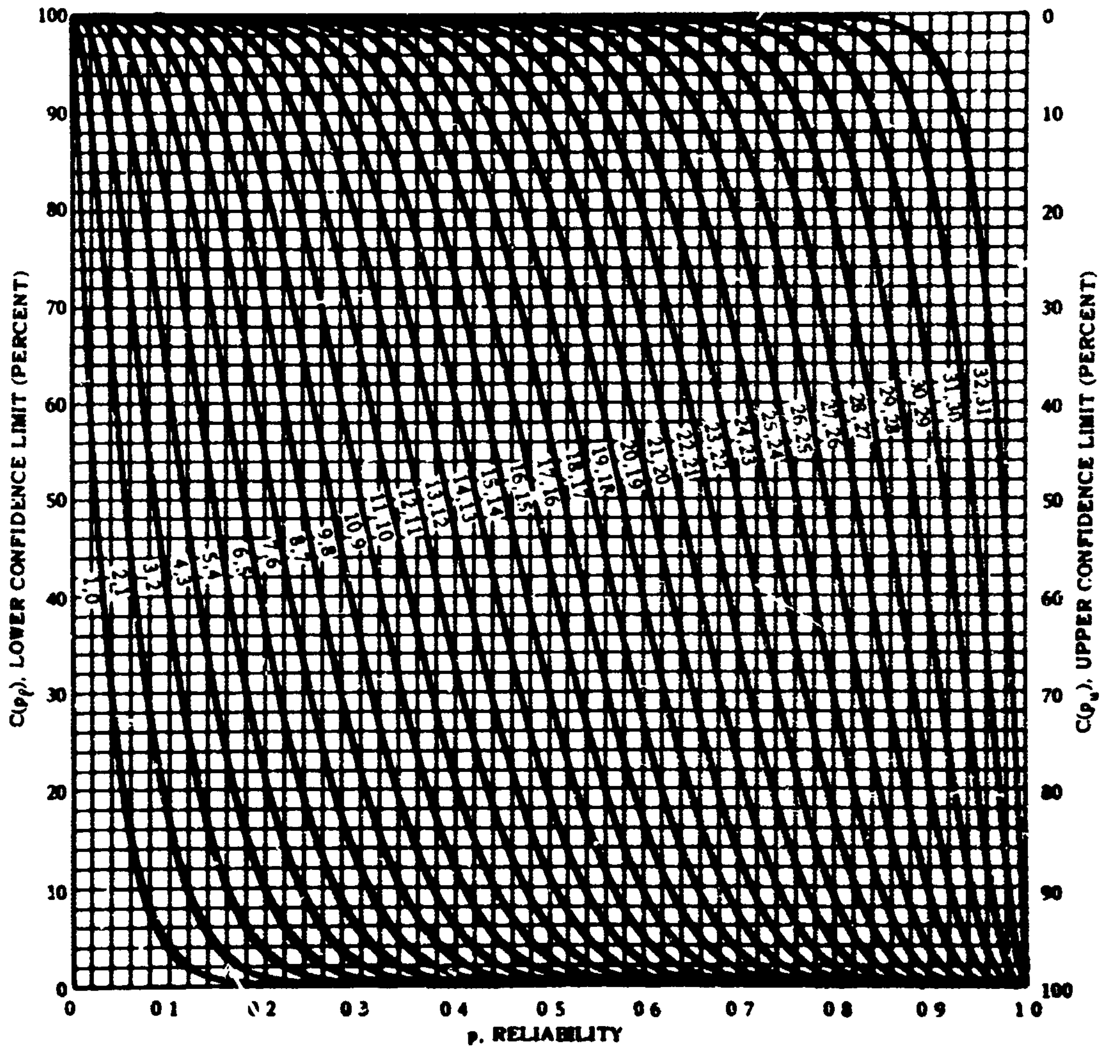
s, (s - 1) = 1,0; 2,1, 3,2; ..., 30,29
(s + 1), s = 1,0; 2,1, 3,2; ...; 30,29
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 30. Reliability Curves for n = 30.



s, (s - 1) = 1,0; 2,1, 3,2; ...; 31,30
(s + 1), s = 1,0; 2,1, 3,2; ...; 31,30
$C(p_l)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_l = 1 - C(p_l)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 31. Reliability Curves for n = 31.



s, (s - 1) = 1,0; 2,1; 3,2; ...; 32,31

(s + 1), s = 1,0; 2,1, 3,2; ..., 32,31

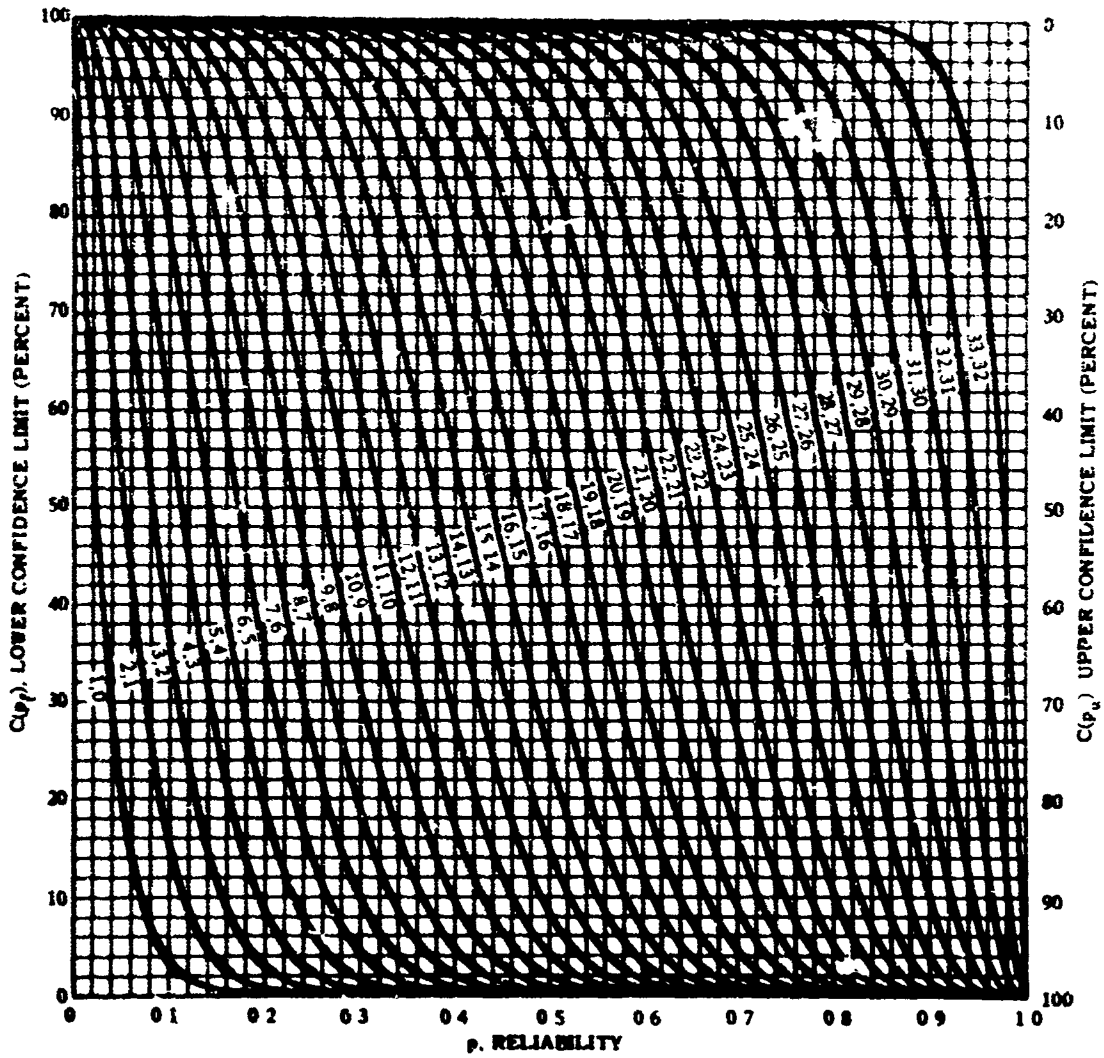
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)

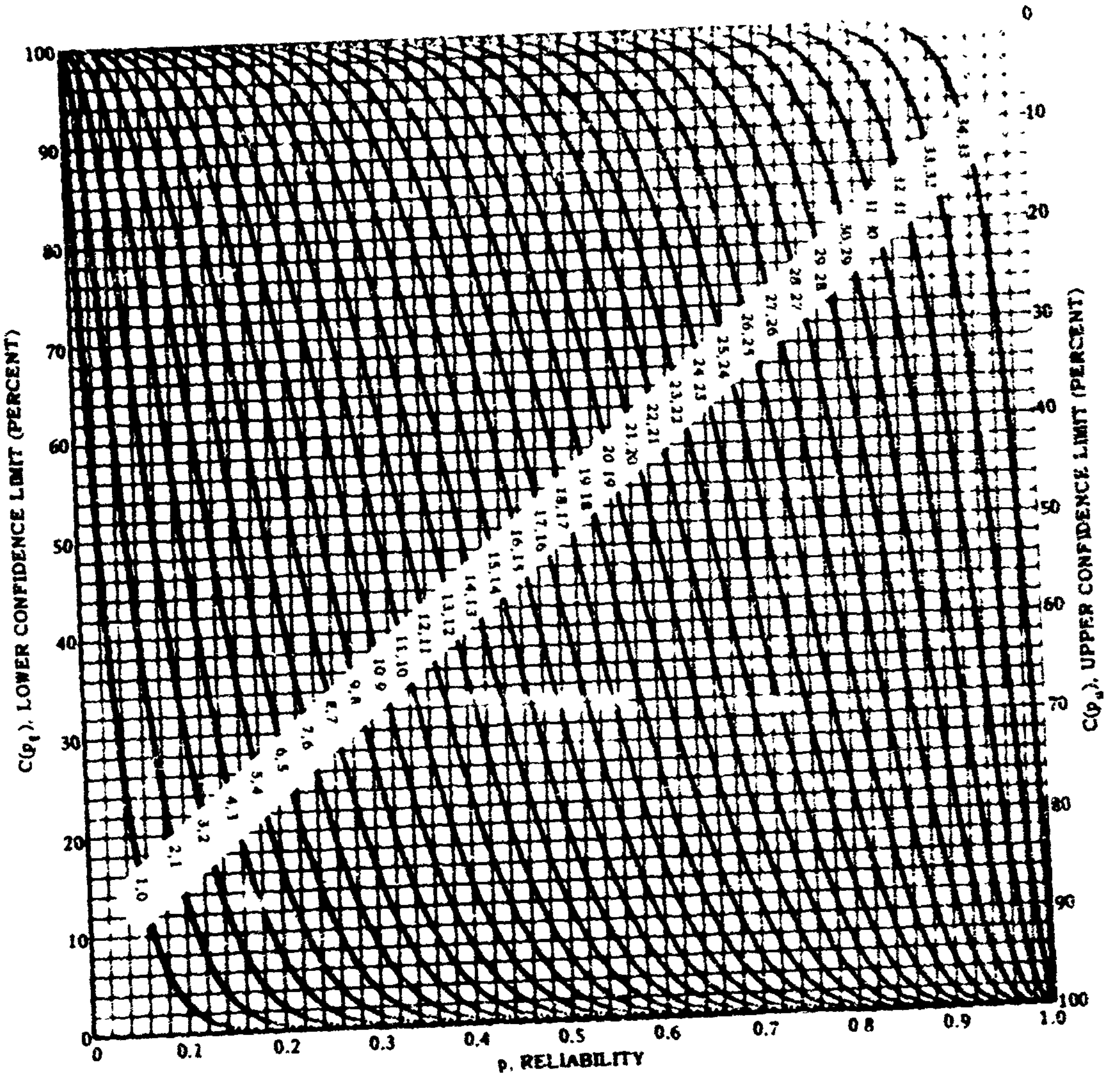
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 32. Reliability Curves for n = 32.



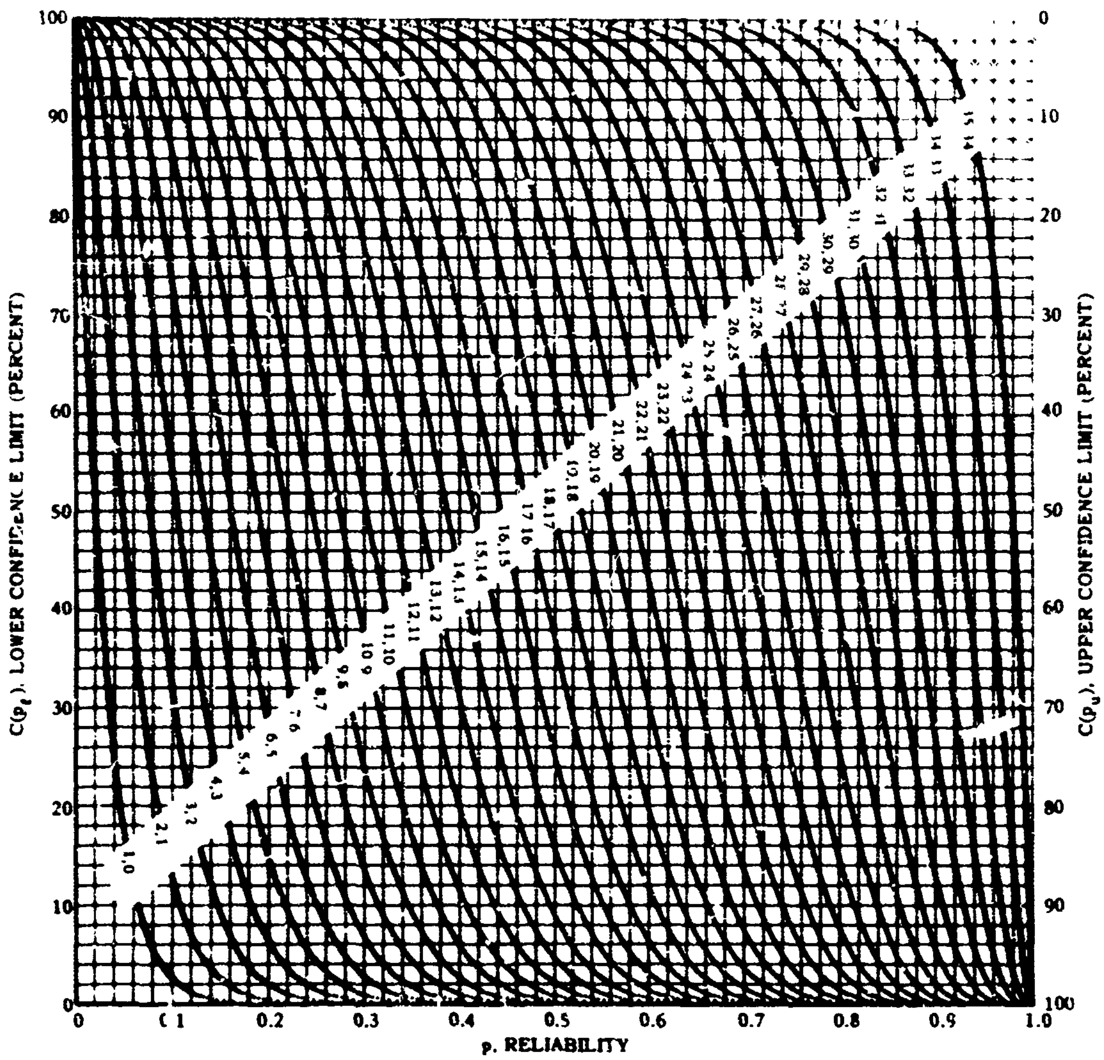
s, (s - 1) = 1,0; 2,1; 3,2; ...; 33,32
(s + 1), s = 1,0; 2,1; 3,2; ...; 33,32
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 33. Reliability Curves for n = 33.



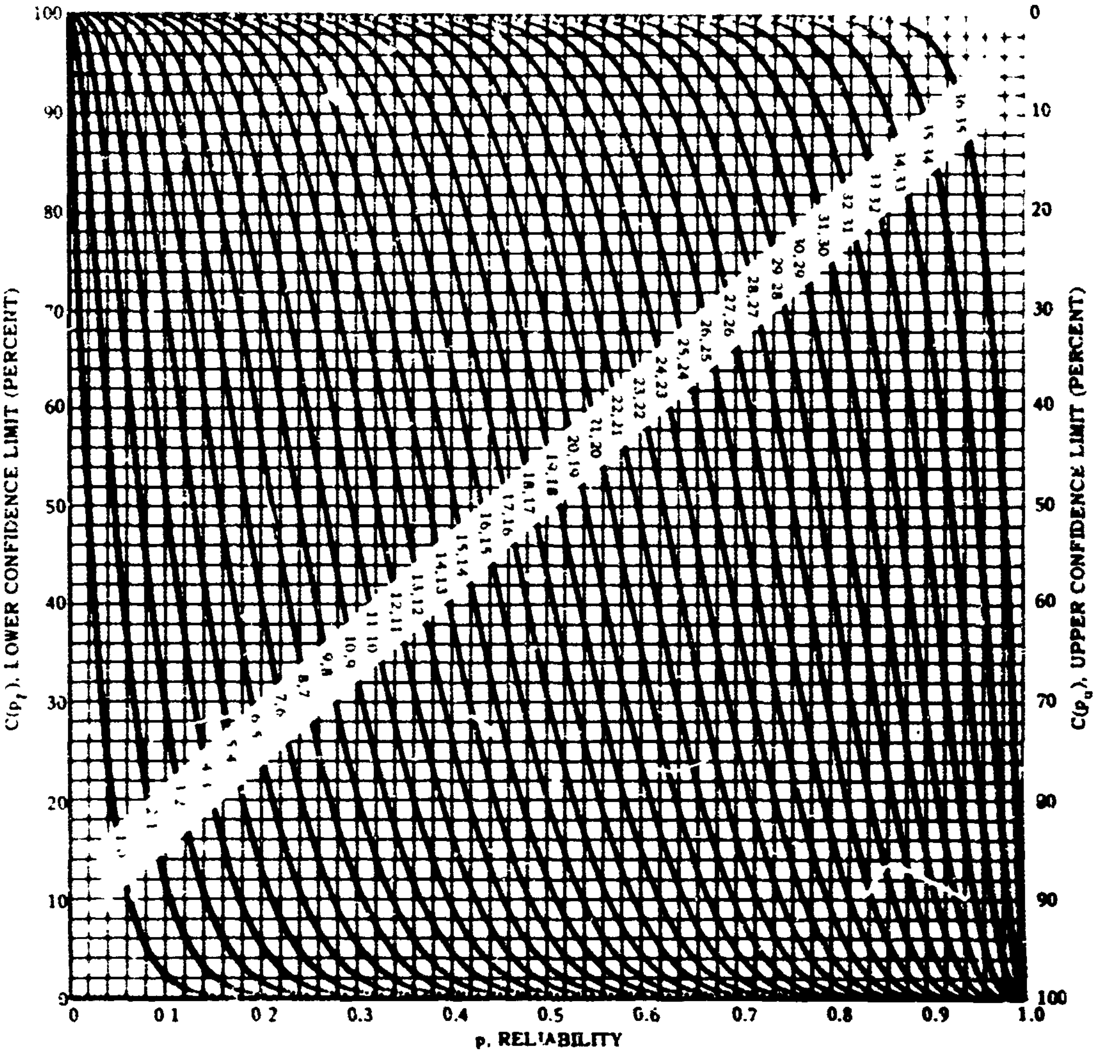
s, (s − 1) = 1,0; 2,1; 3,2; …, 34,33
(s + 1), s = 1 0; 2,1; 3,2; …, 34,33
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 34. Reliability Curves for n = 34.



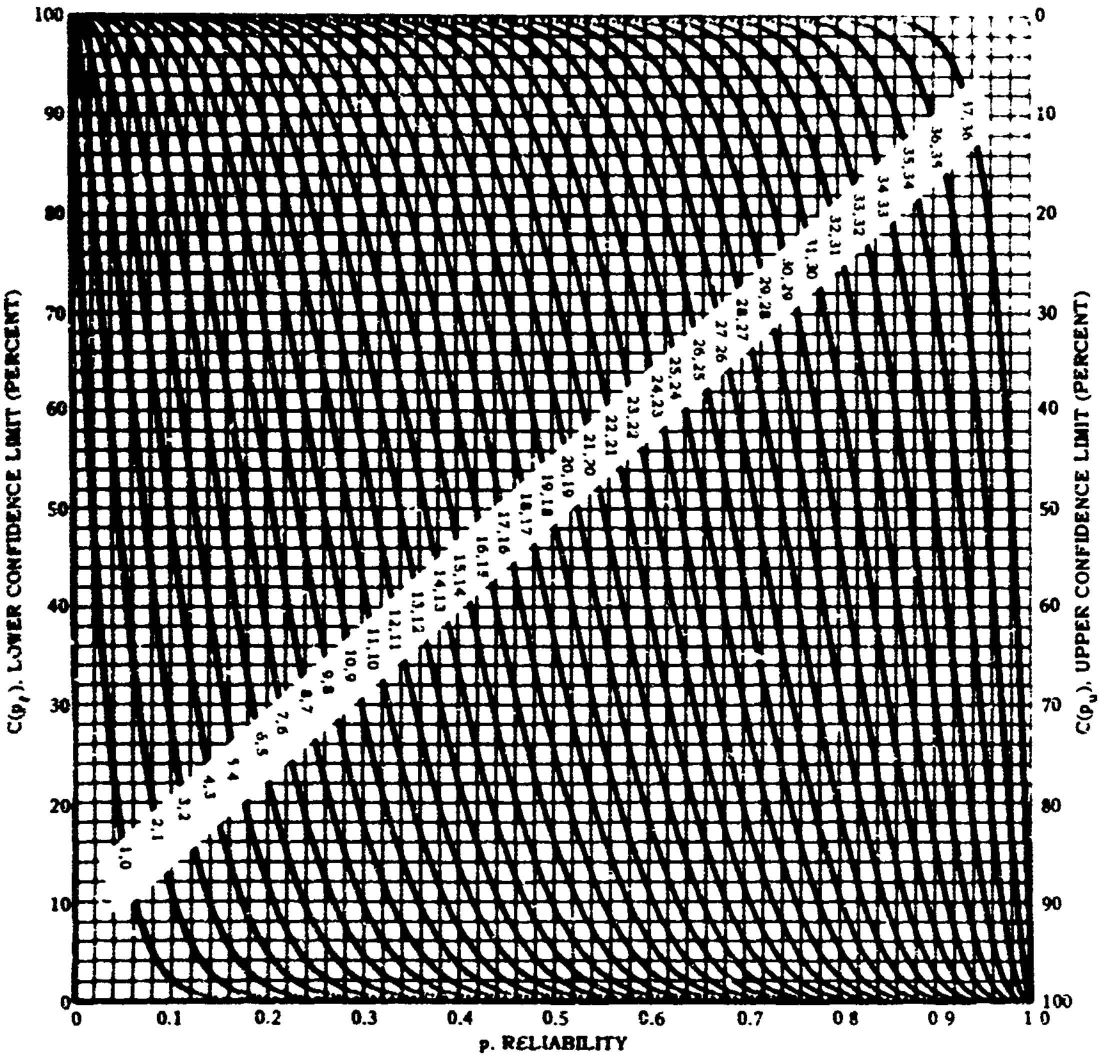
s, (s - 1) = 1,0; 2,1, 3,2; ..., 35,34
(s + 1), s = 1,0; 2,1, 3,2, ..., 35,34
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 35. Reliability Curves for n = 35.



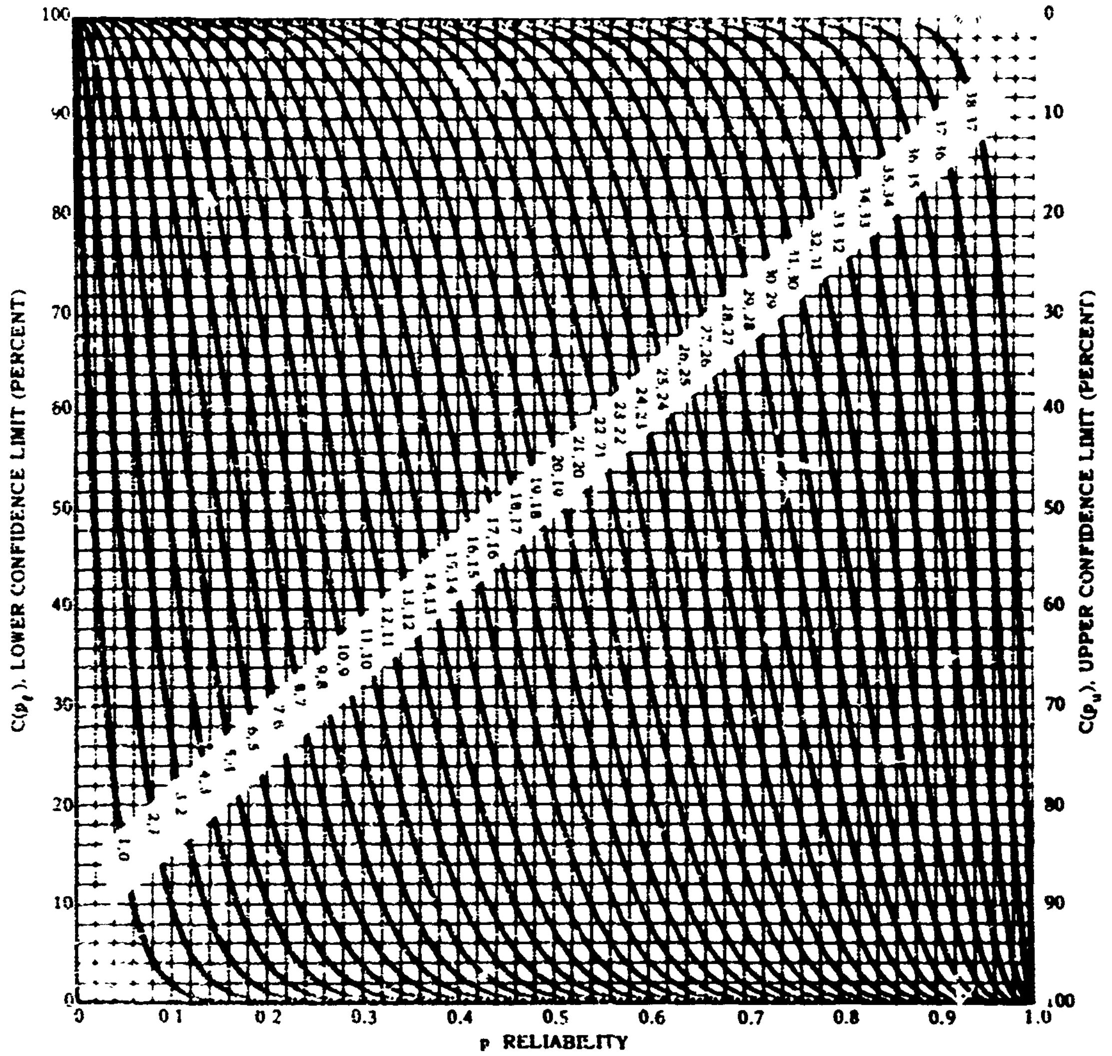
s (s - 1) = 1 0, 2,1, 3,2, ..., 36 35
(s + 1), s = 1 0, 2,1, 3,2, ..., 36,35
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 36. Reliability Curves for n = 36.



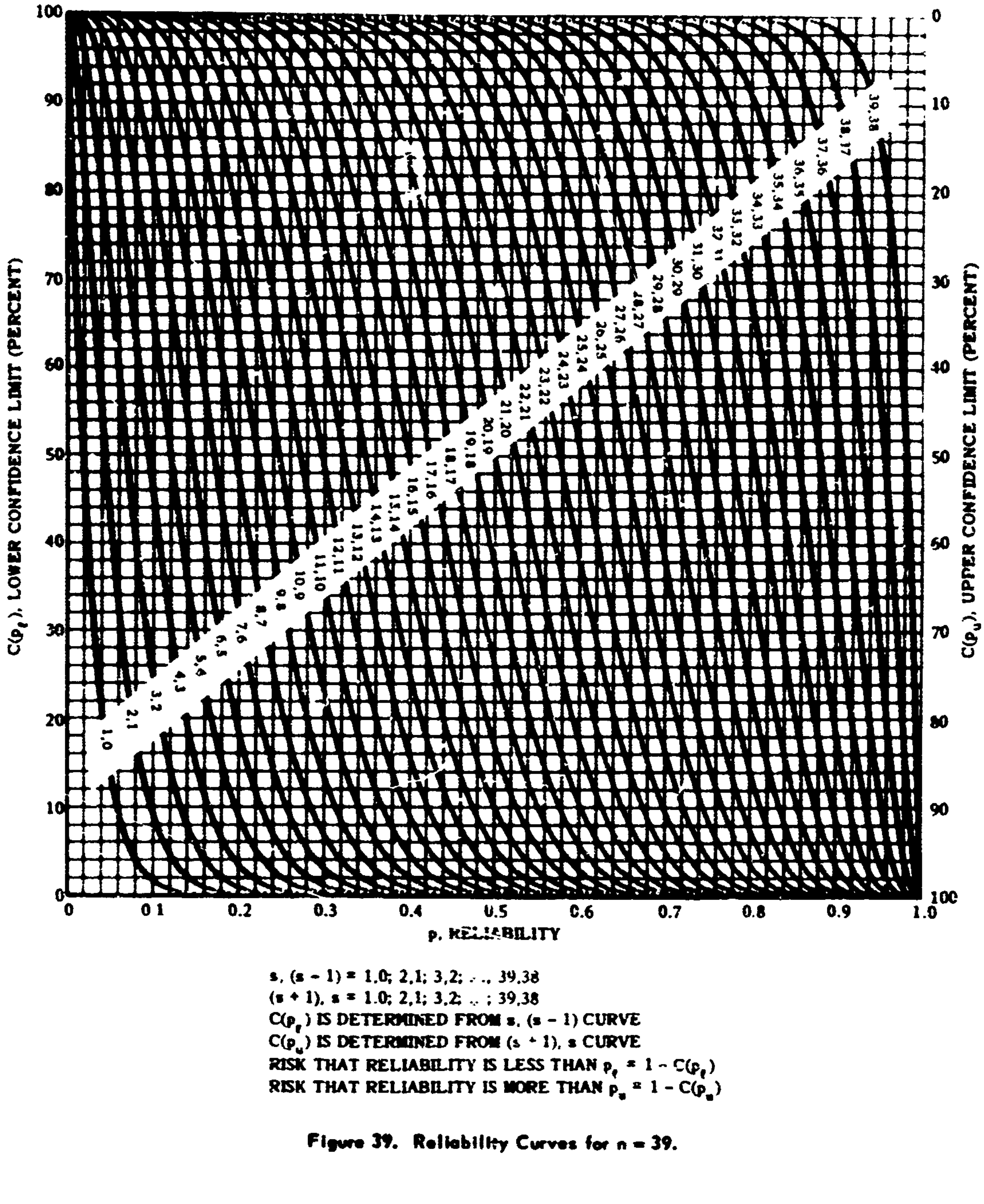
s, (s - 1) = 1,0; 2,1; 3,2; ..., 37 36
(s + 1), s = 1 0, 2,1; 3,2; ..., 37 36
C(p_ℓ) IS DETERMINED FROM s (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 37. Reliability Curves for n = 37.



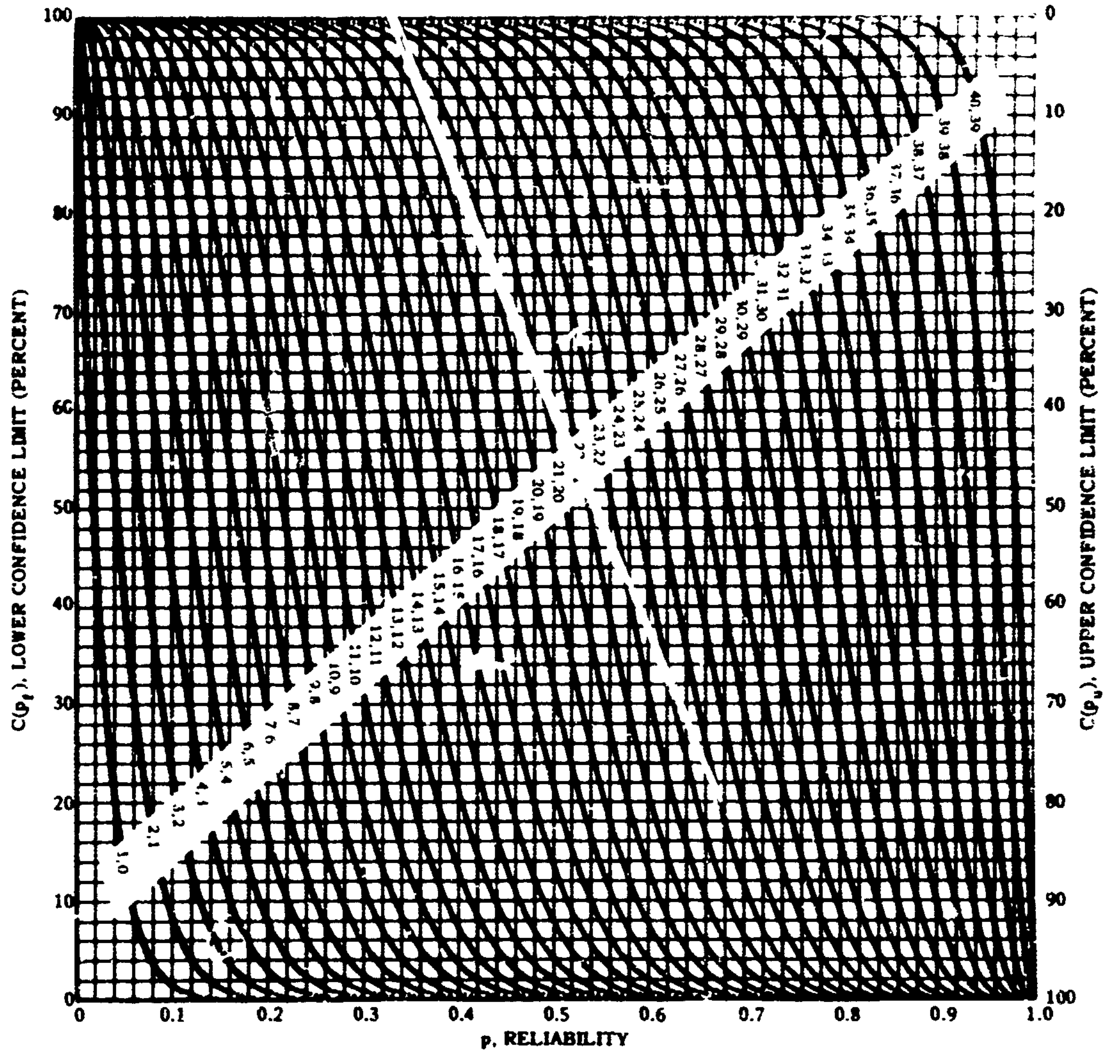
s, (s - 1) = 1,0; 2,1, 3,2, ..., 38,37
(s + 1), s = 1,0, 2,1, 3,2, ... ; 38,37
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 38. Reliability Curves for n = 38.



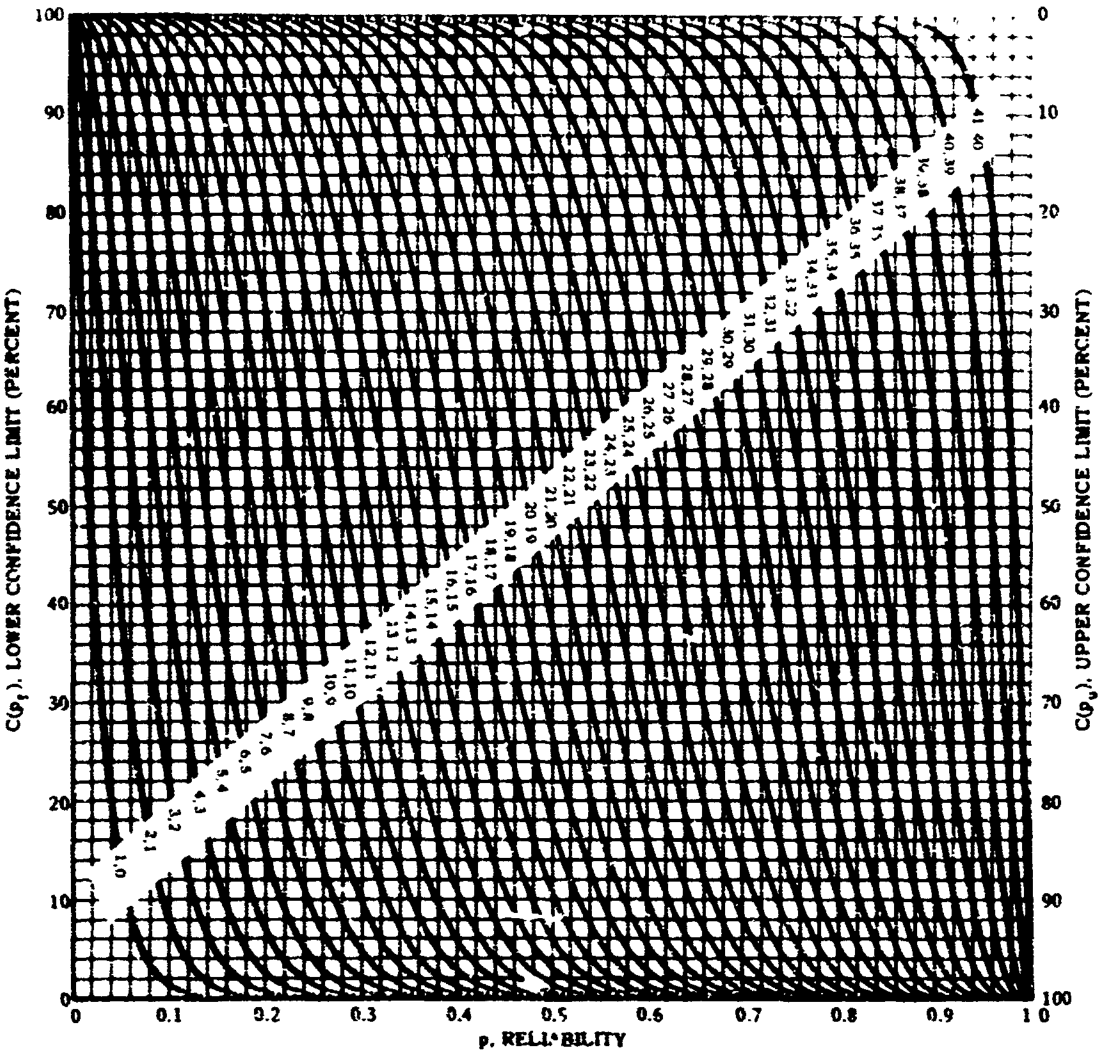
s, (s − 1) = 1,0; 2,1; 3,2; . . ., 39,38
(s + 1), s = 1,0; 2,1; 3,2; . . ; 39,38
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 39. Reliability Curves for n = 39.



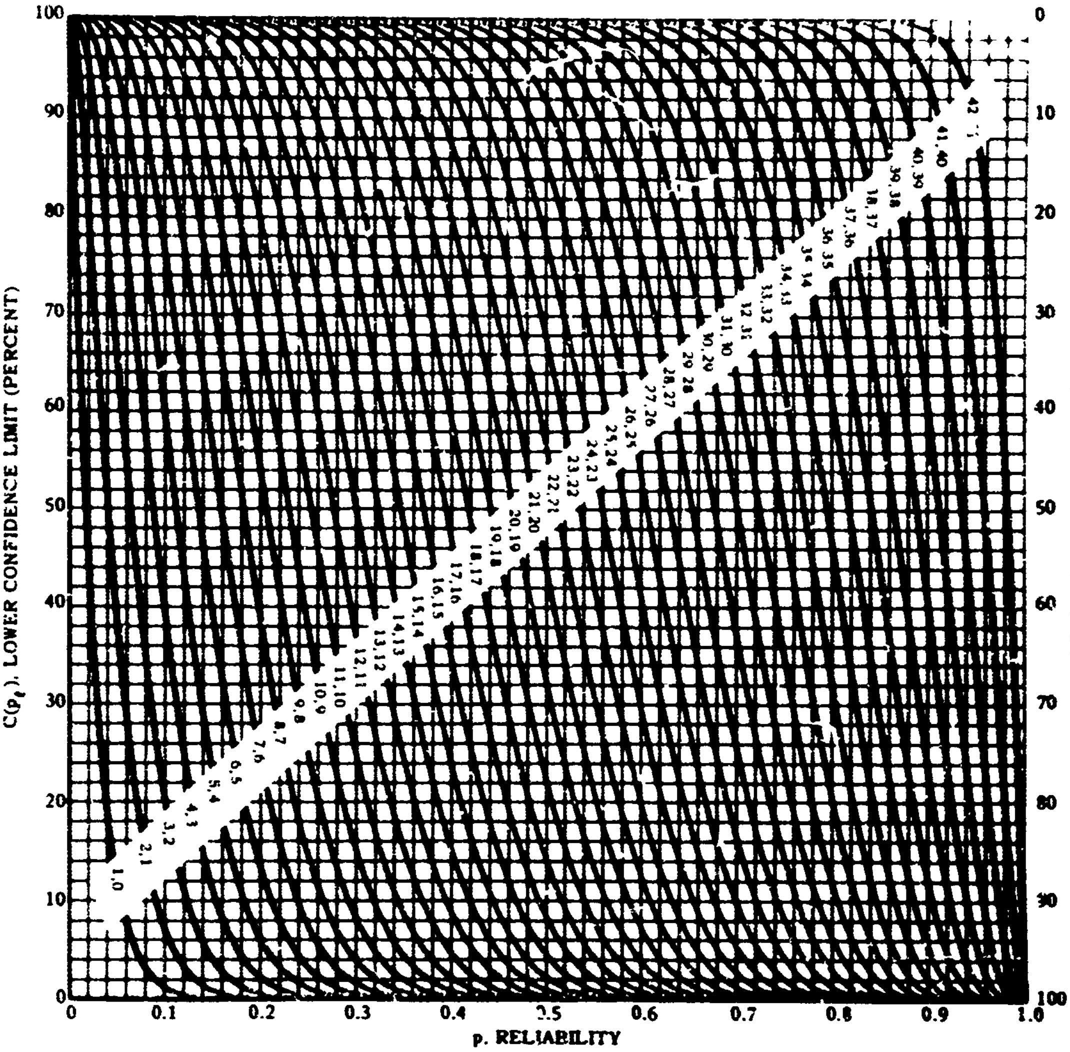
s, (s − 1) = 1,0; 2,1; 3,2; . . ., 40,39
(s + 1), s = 1,0; 2,1; 3,2; . . .; 40,39
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 40. Reliability Curves for n = 40.



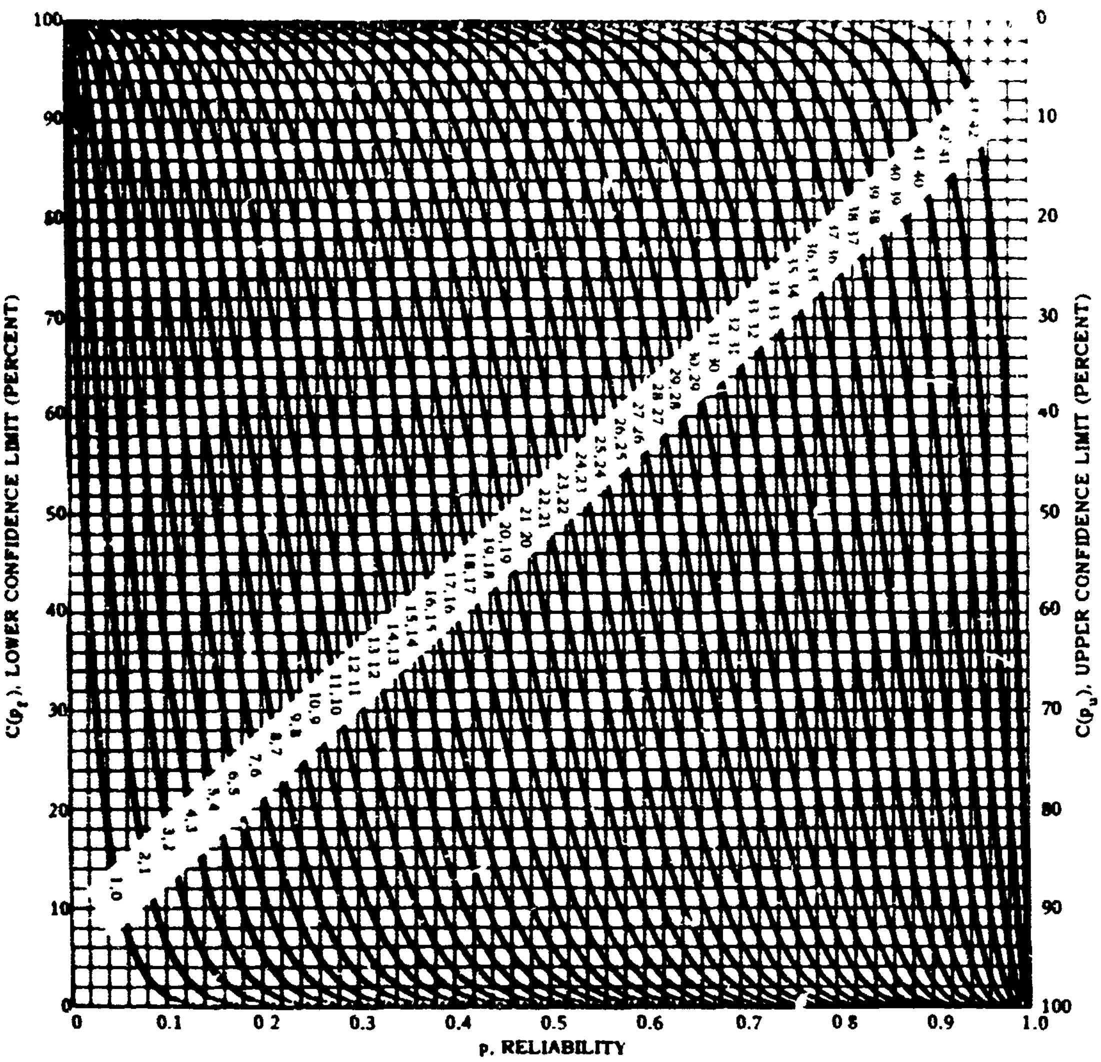
s, (s − 1) = 1,0; 2,1; 3,2; ..., 41,40
(s + 1), s = 1,0; 2,1; 3,2; ...; 41,40
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 41. Reliability Curves for n = 41.



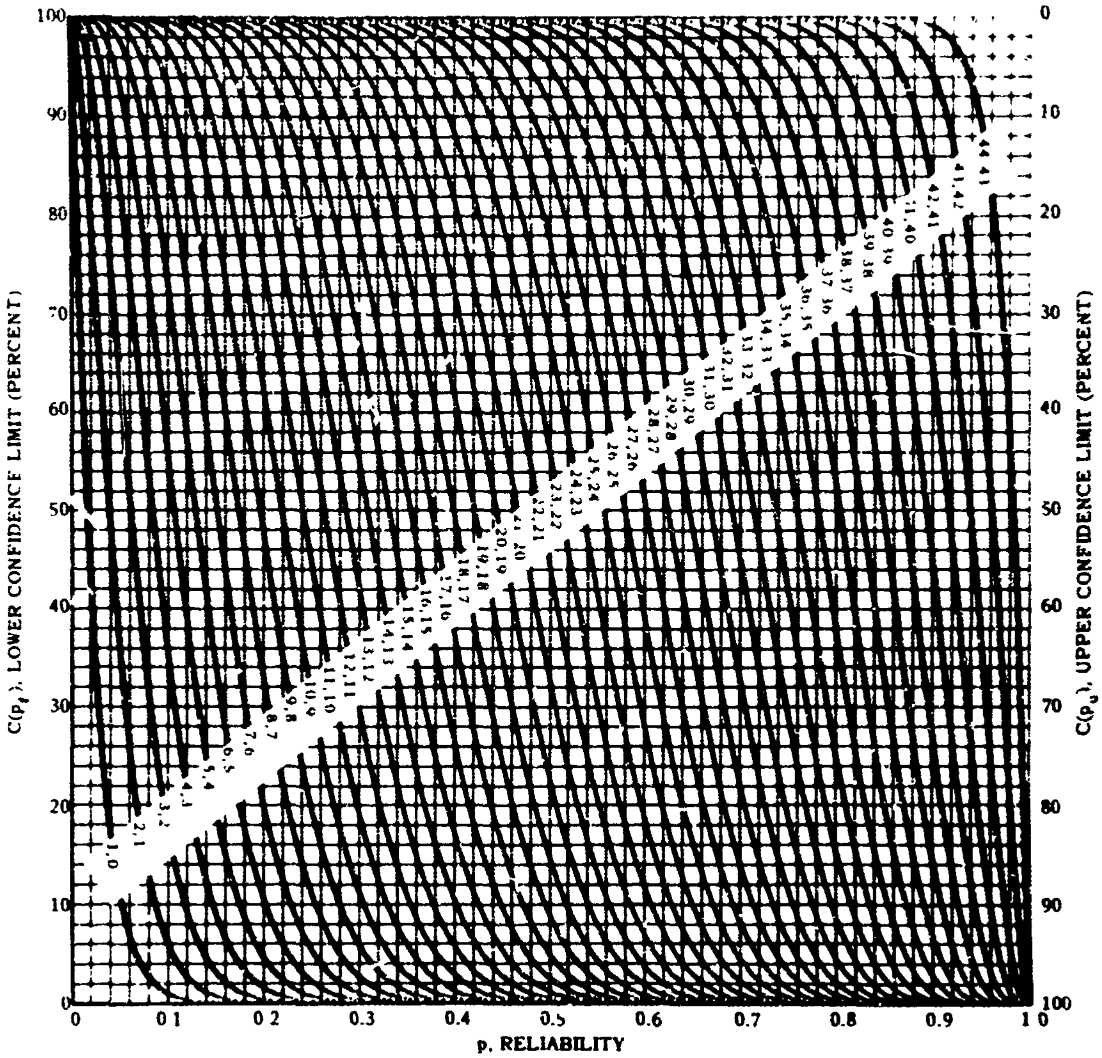
s, (s - 1) = 1,0; 2,1; 3,2; ...; 42,41
(s + 1), s = 1 0; 2,1; 3,2, ..., 42,41
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 42. Reliability Curves for n = 42.



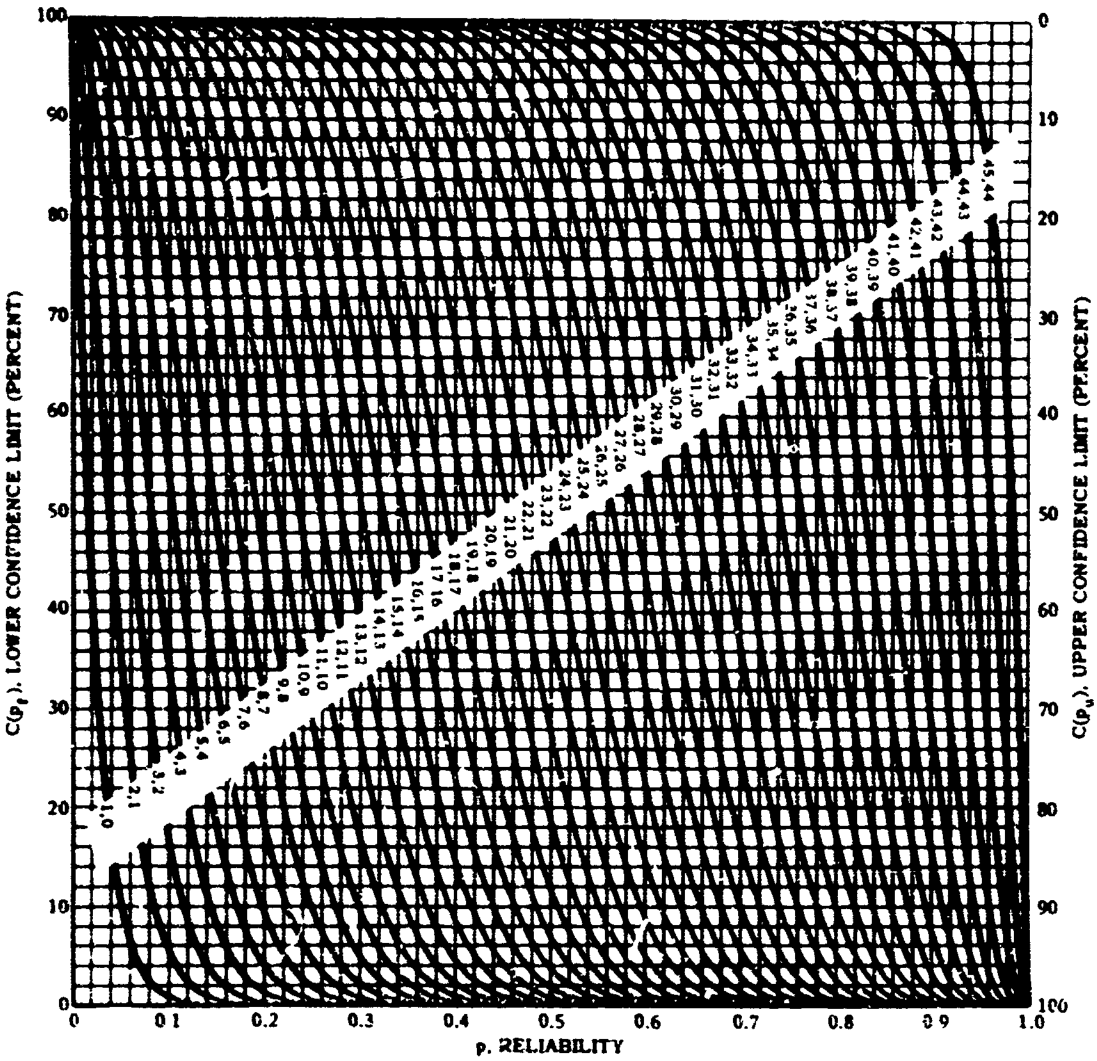
s, (s - 1) = 1,0; 2,1, 3,2, ...; 43,42
(s + 1), s = 1 0; 2,1, 3,2, ..., 43,42
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 43. Reliability Curves for n = 43.



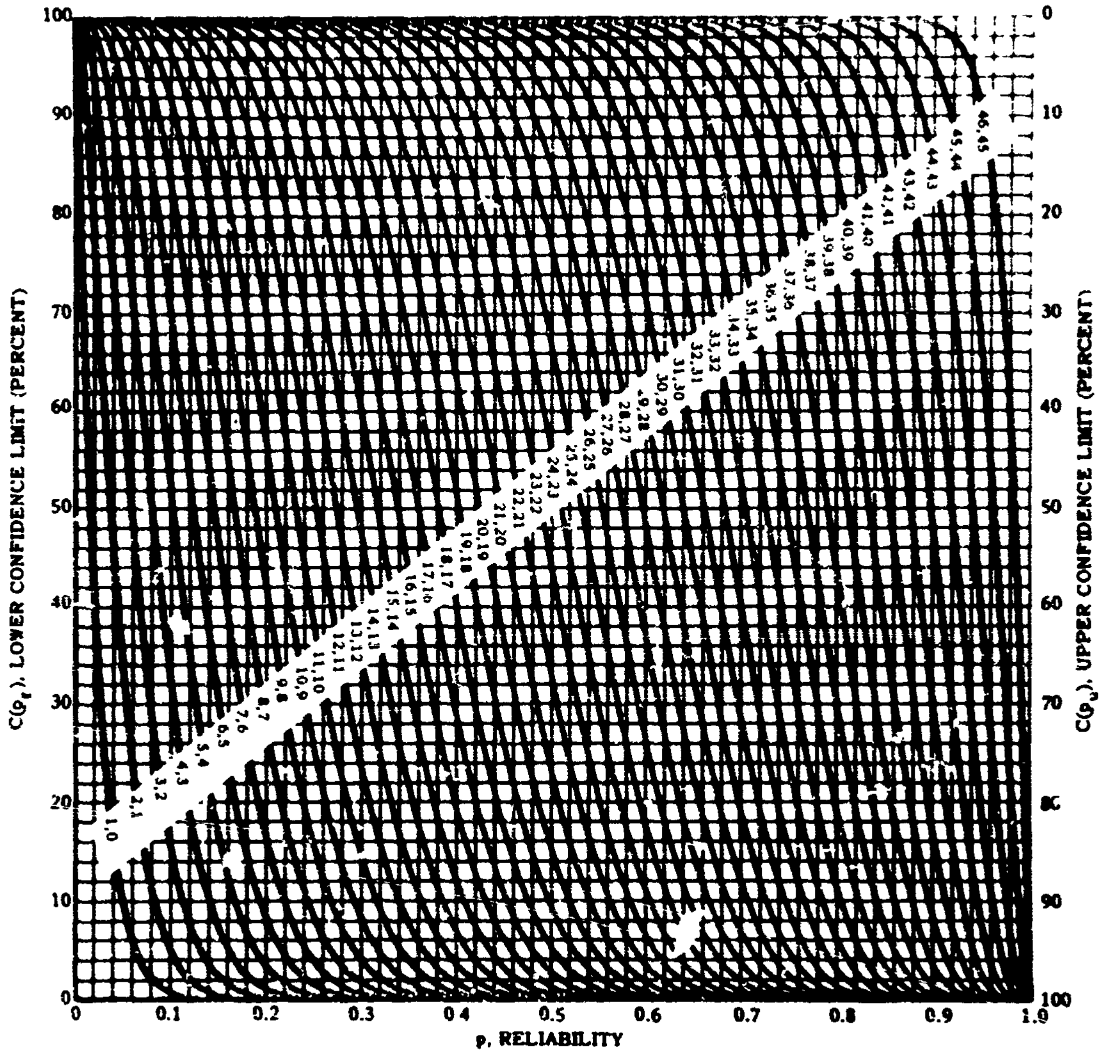
s, (s - 1) = 1,0; 2,1, 3,2; ..., 44,43
(s + 1), s = 1,0; 2,1, 3,2, ..., 44,43
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 44. Reliability Curves for n = 44.



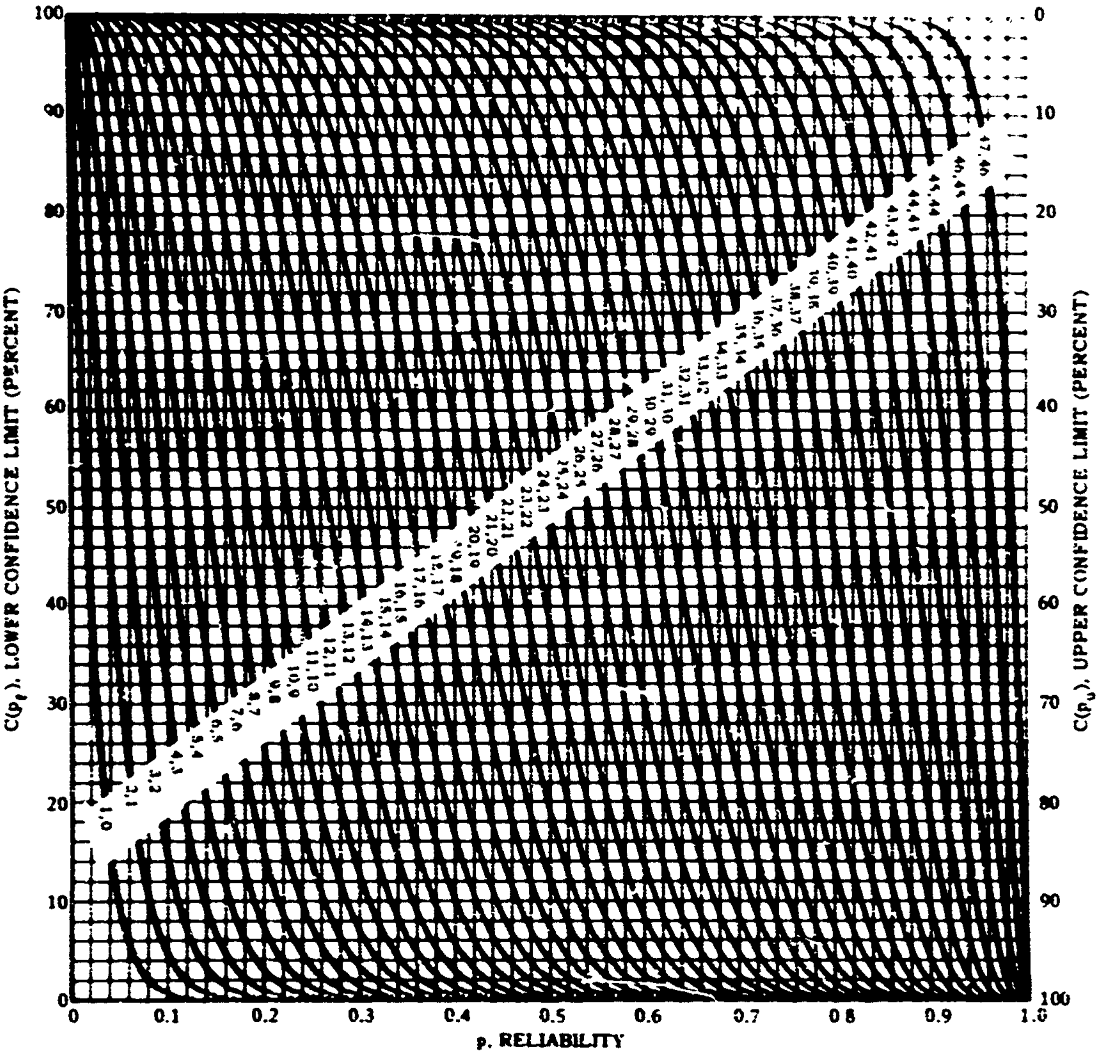
s, (s - 1) = 1,0; 2,1, 3,2, . . ., 45,44
(s + 1), s = 1 0; 2,1, 3,2; . . ., 45,44
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 45. Reliability Curves for n = 45.



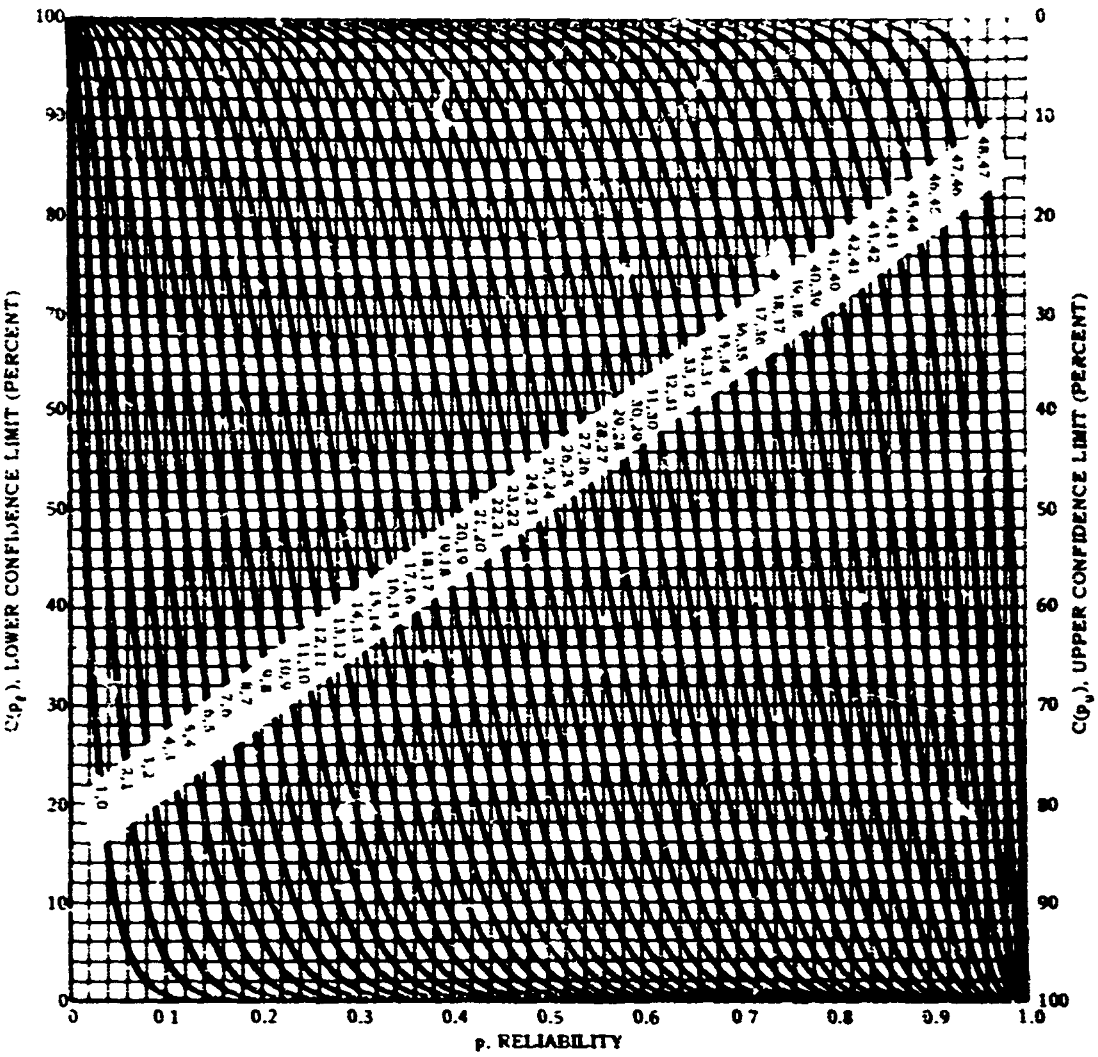
$s, (s-1) = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 46,45$
$(s+1), s = 1,0;\ 2,1;\ 3,2;\ \ldots;\ 46,45$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 46. Reliability Curves for n = 46.



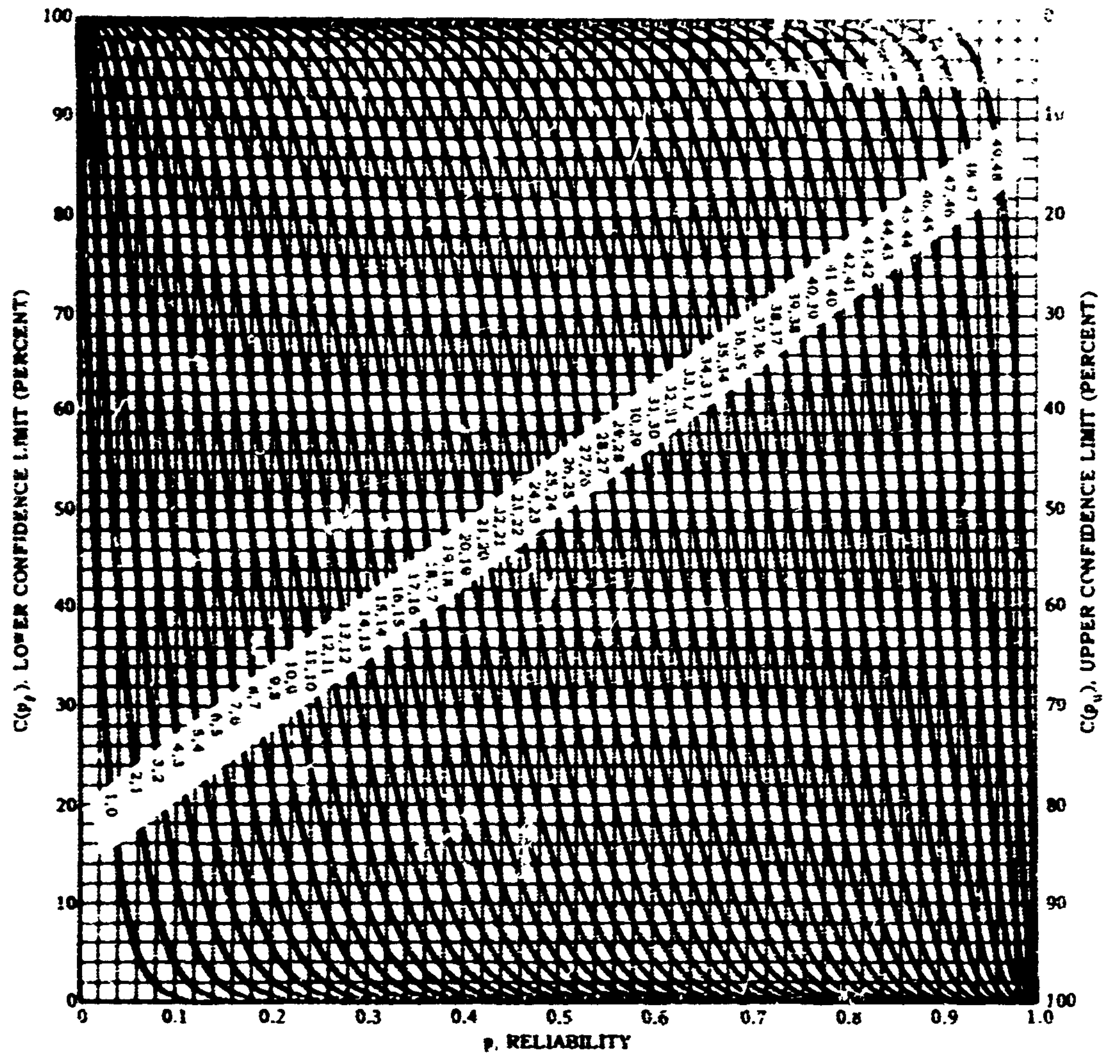
s, (s - 1) = 1,0; 2,1; 3,2; ..., 47,46
(s + 1), s = 1,0; 2,1; 3,2, ...; 47,46
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 47. Reliability Curves for n = 47.



s, (s − 1) = 1,0; 2,1; 3,2; . . .; 48,47
(s + 1), s = 1,0; 2,1; 3,2; . . .; 48,47
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 48. Reliability Curves for n = 48.



$s, (s-1) = 1{,}0;\ 2{,}1;\ 3{,}2;\ \ldots;\ 49{,}48$

$(s+1), s = 1{,}0;\ 2{,}1;\ 3{,}2;\ \ldots;\ 49{,}48$

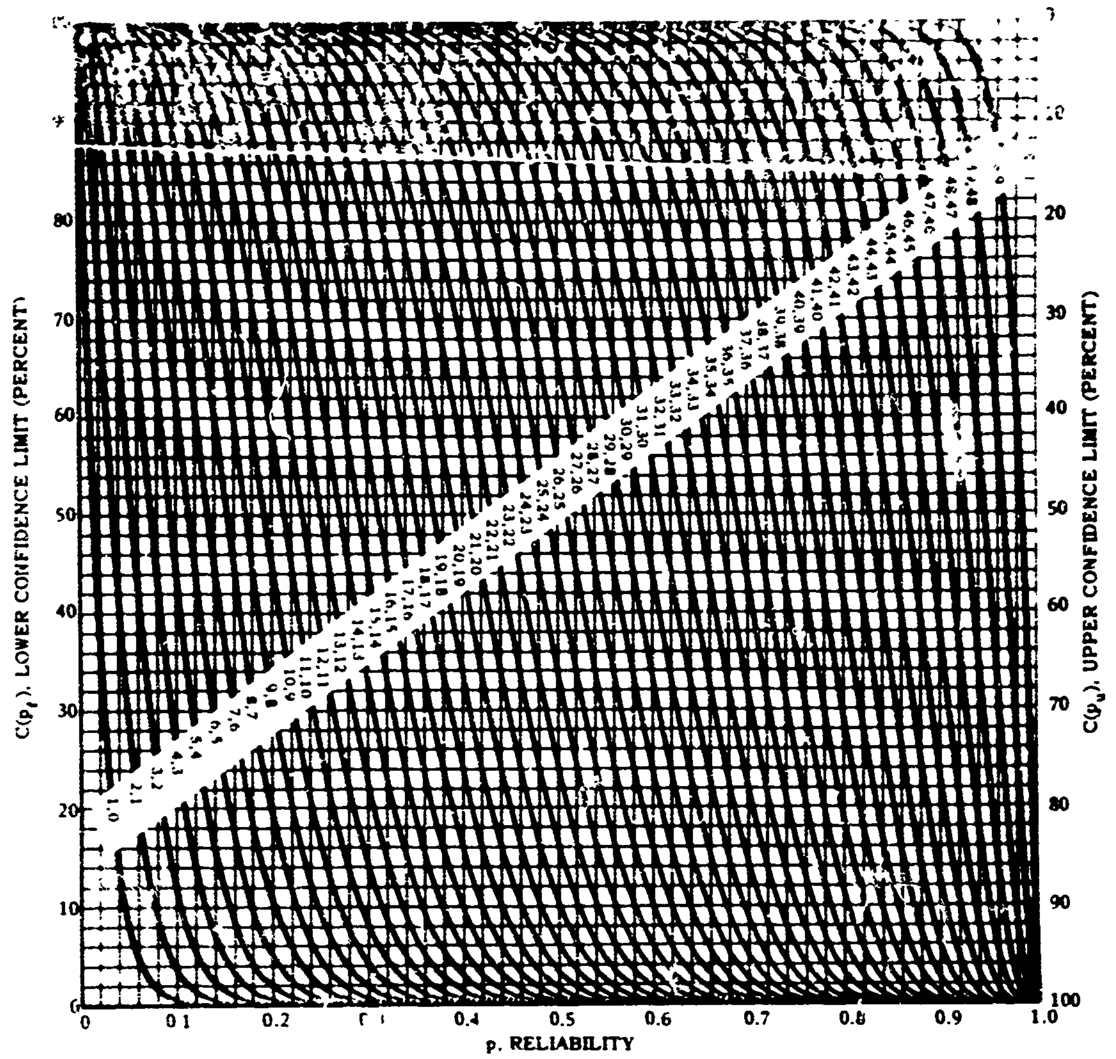
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

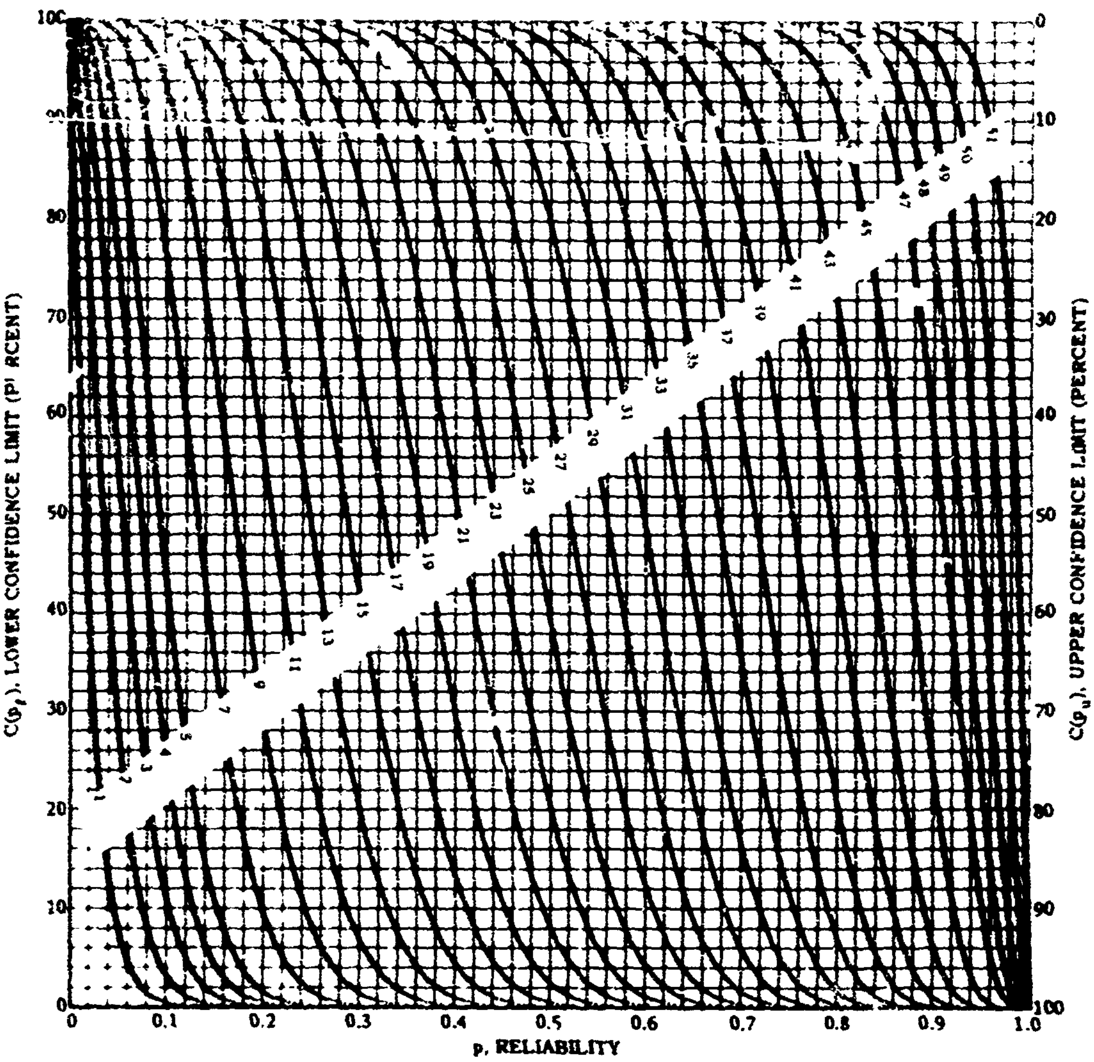
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 49. Reliability Curves for $n = 49$.



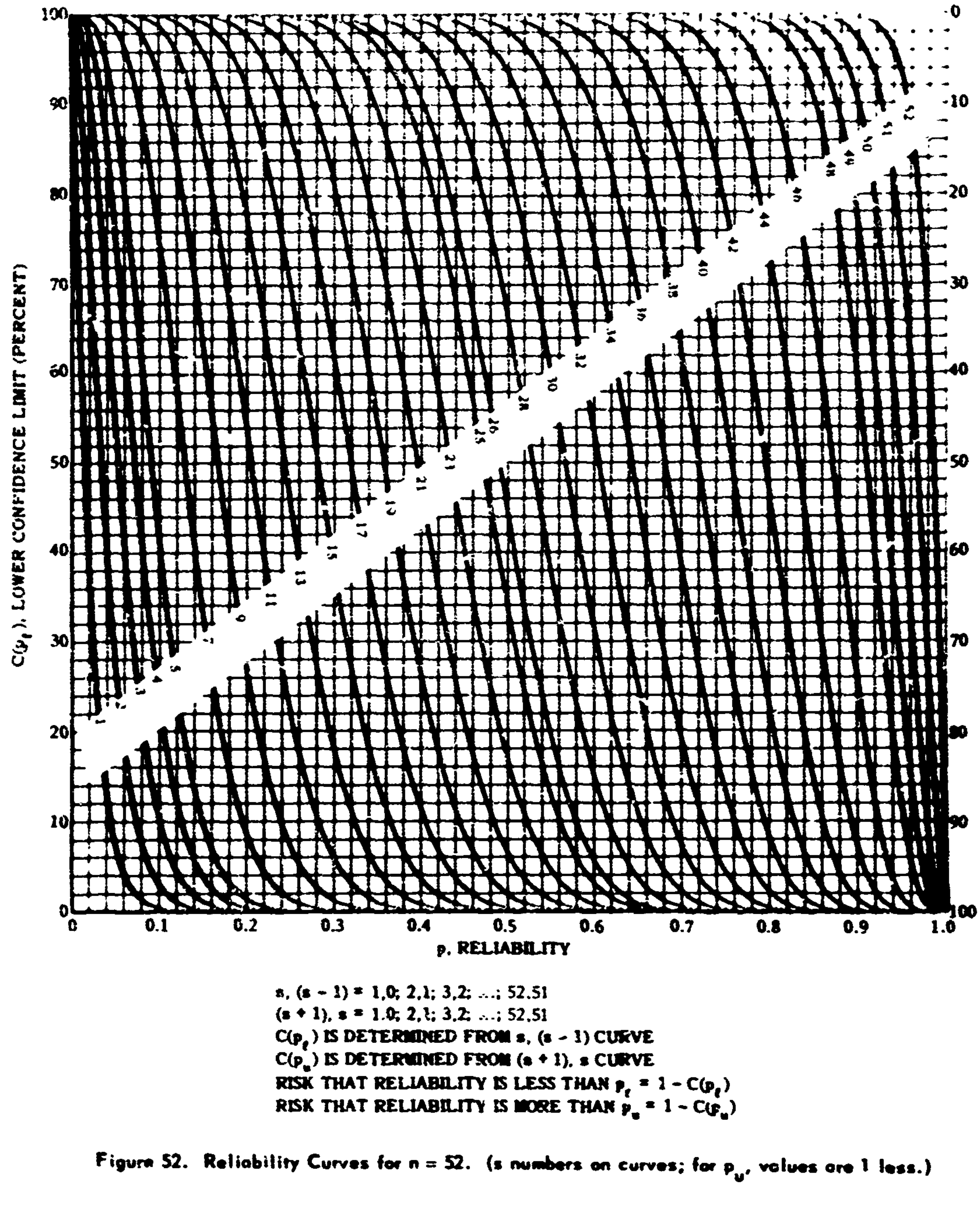
s, (s - 1) = 1,0; 2,1, 3,2; ...; 50,49
(s + 1), s = 1,0; 2,1, 3,2, ..., 50,49
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 50. Reliability Curves for n = 50.



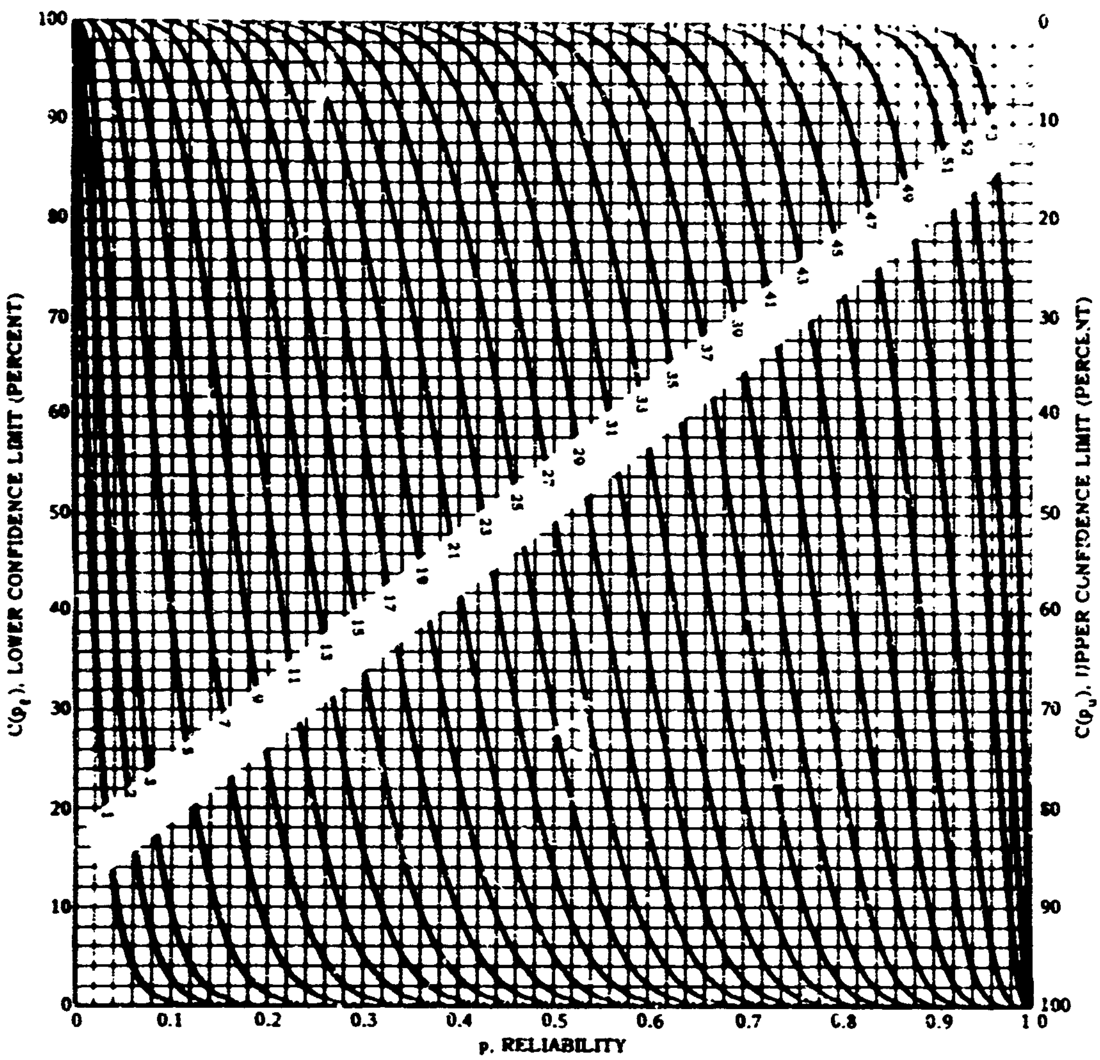
s, (s − 1) = 1,0; 2,1; 3,2; ...; 51,50
(s + 1), s = 1,0; 2,1; 3,2; ...; 51,50
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 51. Reliability Curves for n = 51. (s numbers on curves; for p_u, values are 1 less.)



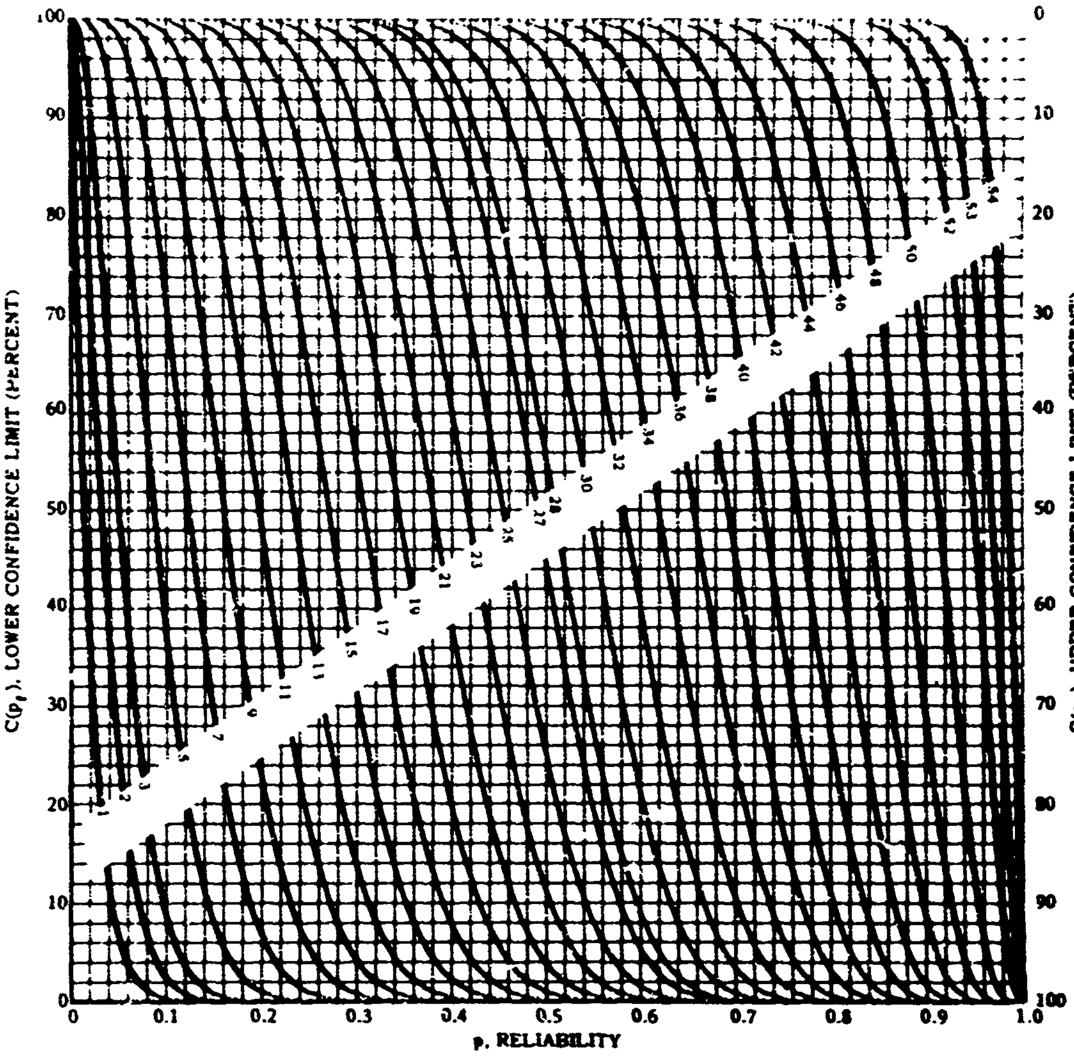
s, (s − 1) = 1,0; 2,1; 3,2; ...; 52,51
(s + 1), s = 1,0; 2,1; 3,2; ...; 52,51
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 52. Reliability Curves for n = 52. (s numbers on curves; for p_u, values are 1 less.)



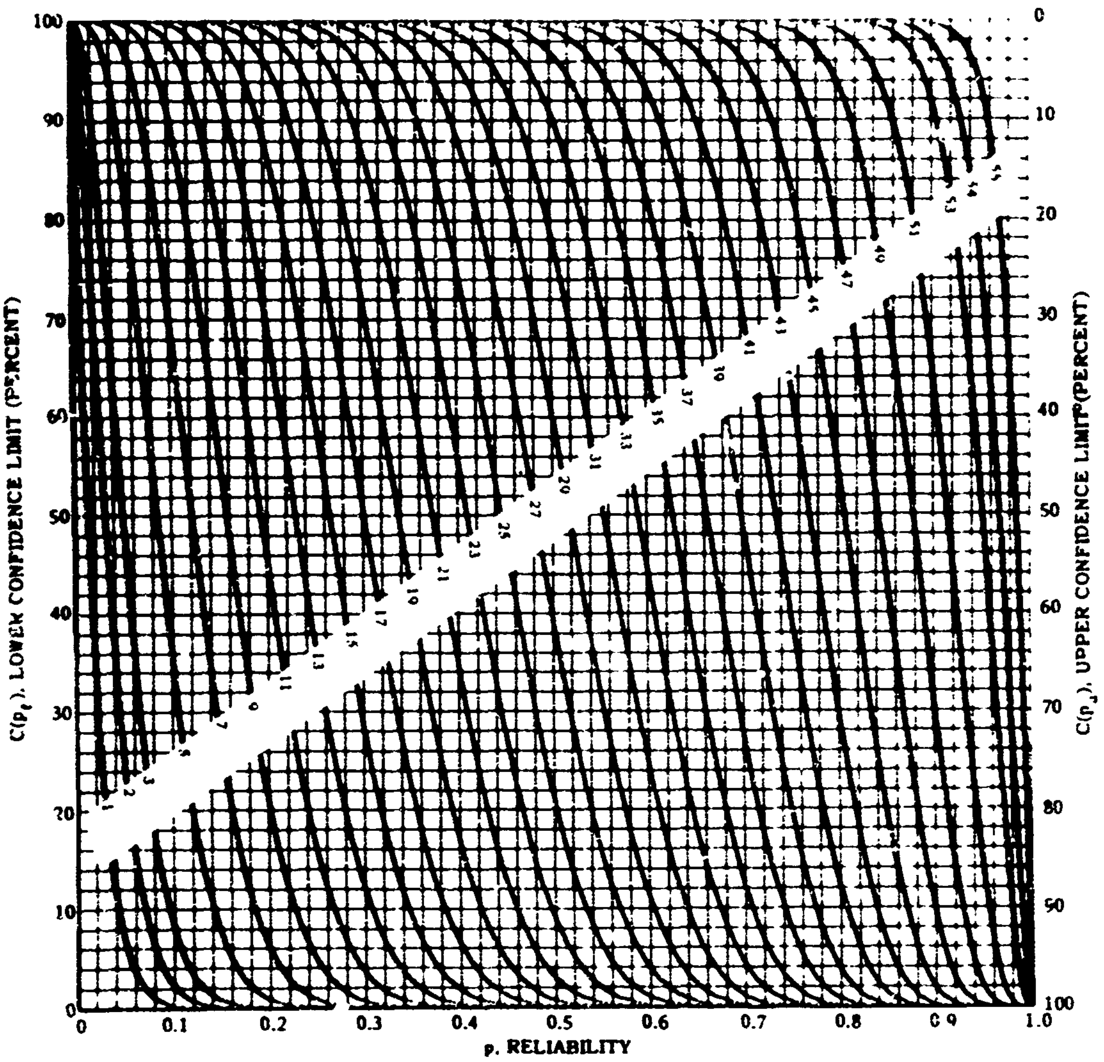
s, (s - 1) = 1,0; 2,1; 3,2, ...; 53,52
(s + 1), s = 1,0; 2,1, 3,2; ..., 53,52
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 53. Reliability Curves for n = 53. (s numbers on curves; for p_u, values are 1 less.)



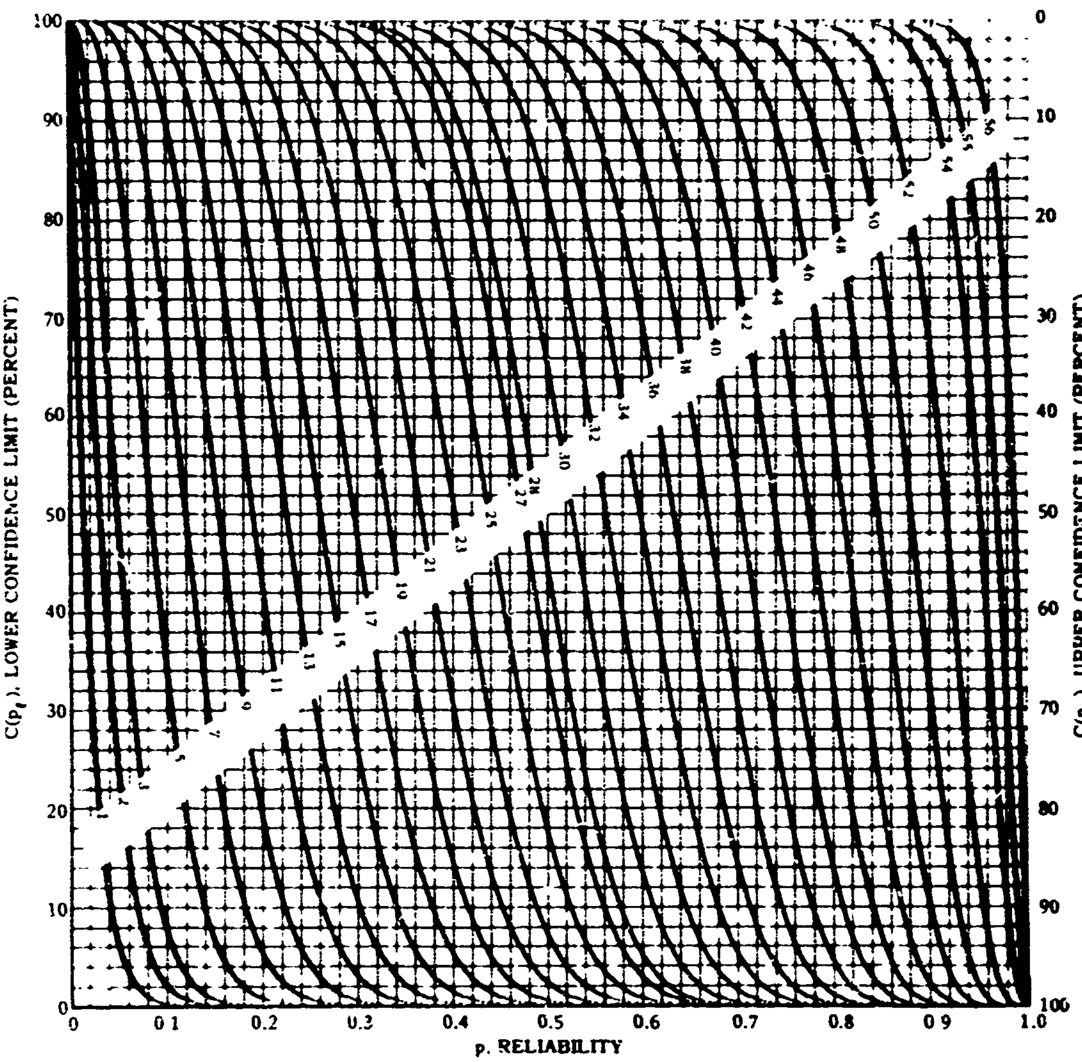
s, (s − 1) = 1,0; 2,1; 3,2; ...; 54,53
(s + 1), s = 1,0; 2,1; 3,2; ...; 54,53
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 54. Reliability Curves for n = 54. (s numbers on curves; for p_u, values are 1 less.)



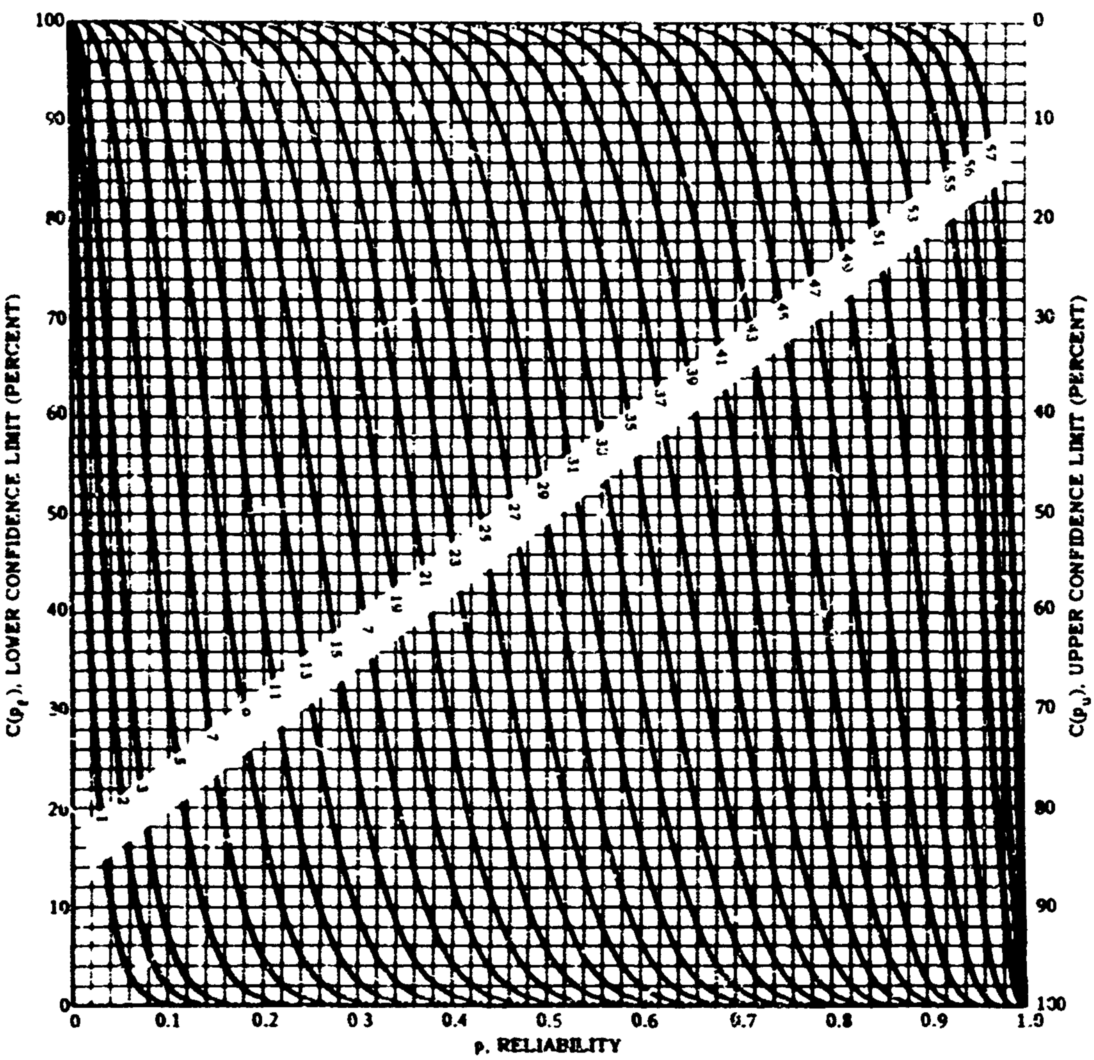
s, (s - 1) = 1,0; 2,1; 3,2; ...; 55,54
(s + 1), s = 1,0; 2,1; 3,2; ...; 55,54
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 55. Reliability Curves for n = 55. (s numbers on curves; for p_u, values are 1 less.)



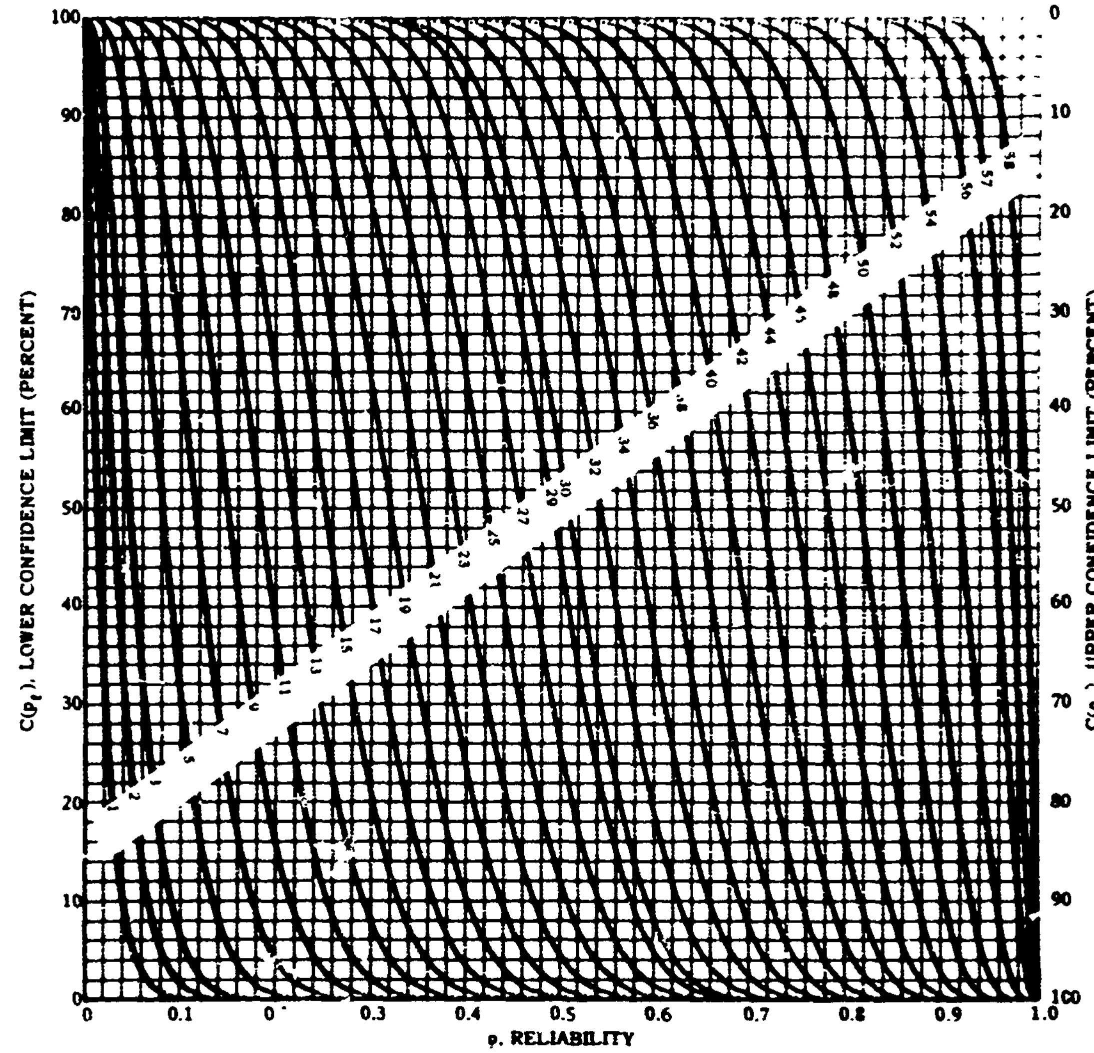
s, (s − 1) = 1,0; 2,1; 3,2, ..., 56,55
(s + 1), s = 1 0; 2,1; 3,2; ..., 56,55
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 56. Reliability Curves for n = 56. (s numbers on curves; for p_u, values are 1 less.)



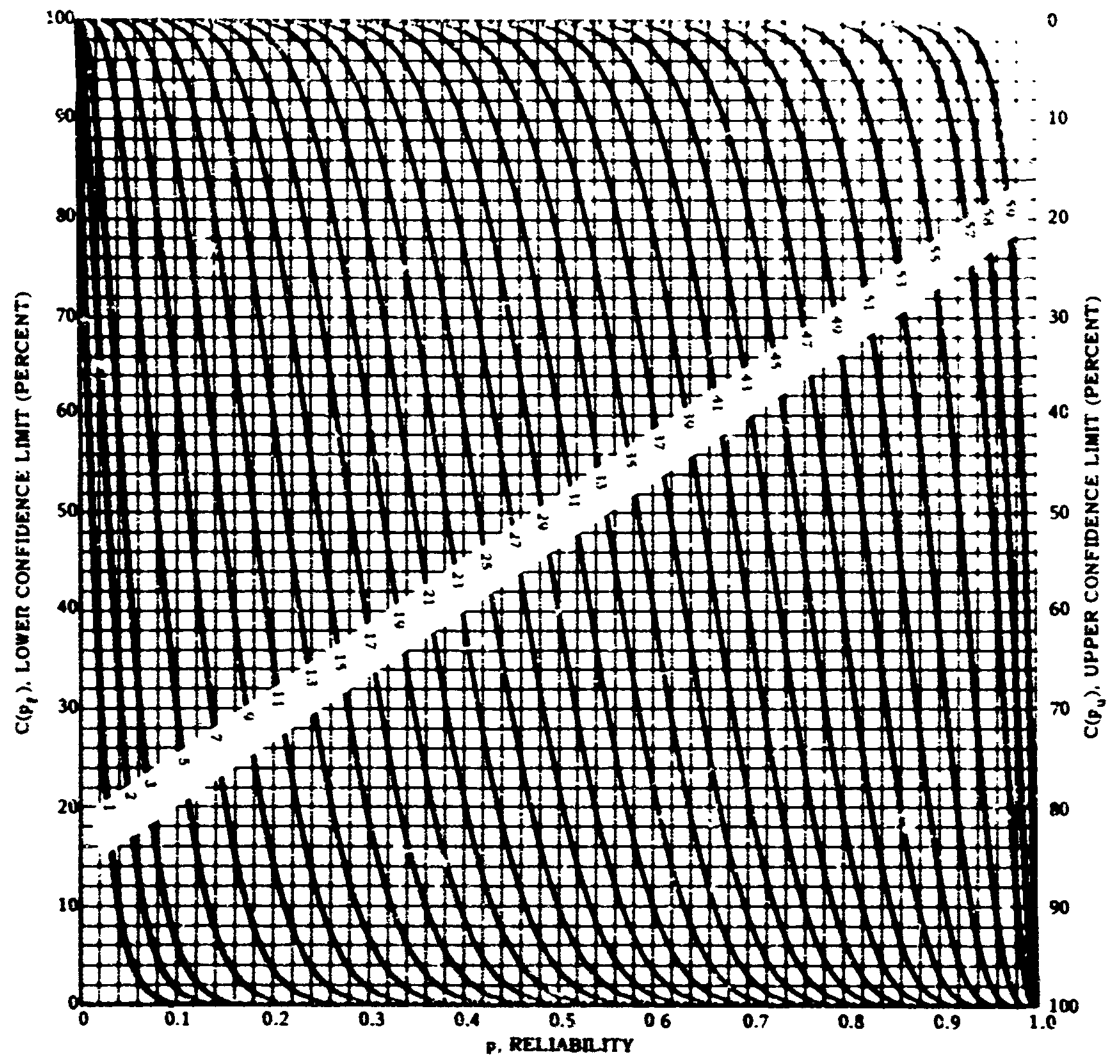
s, (s - 1) = 1,0; 2,1; 3,2; ...; 57,56
(s + 1), s = 1,0; 2,1; 3,2; ...; 57,56
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 57. Reliability Curves for n = 57. (s numbers on curves; for p_u, values are 1 less.)



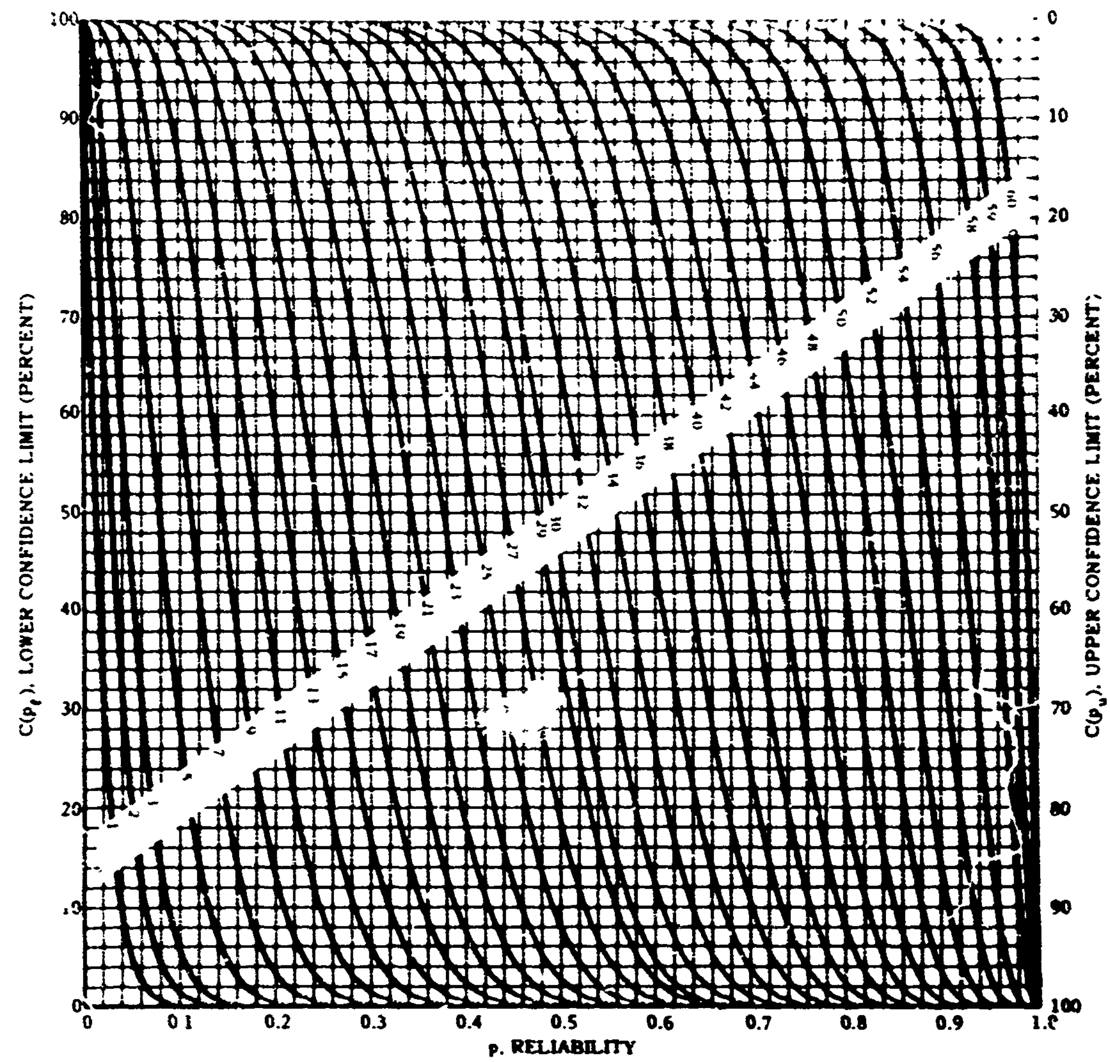
s, (s − 1) = 1,0; 2,1; 3,2; ... ; 58,57
(s + 1), s = 1,0; 2,1; 3,2; ...; 58,57
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 58. Reliability Curves for n = 58. (s numbers on curves; for p_u, values are 1 less.)



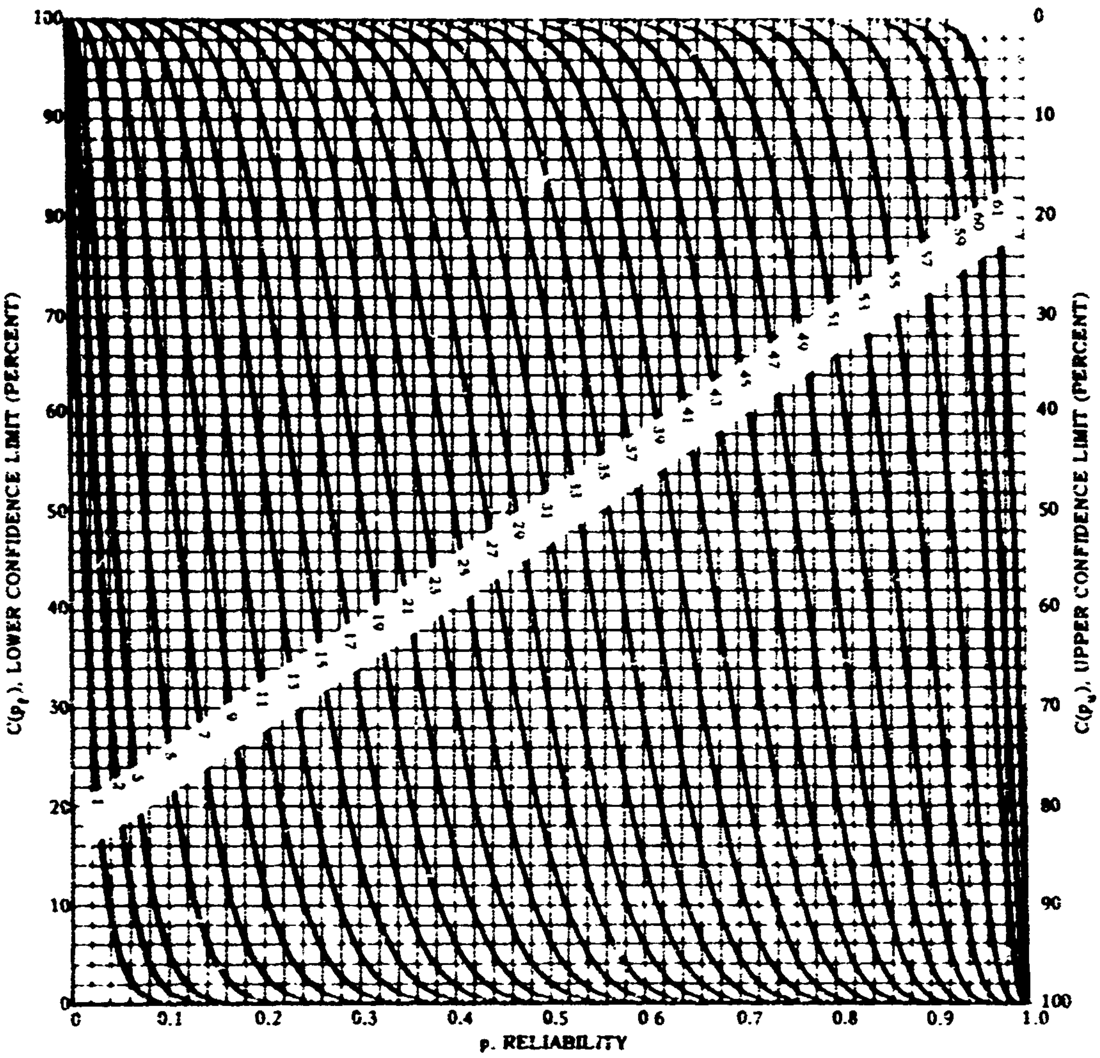
s, (s − 1) = 1,0; 2,1; 3,2; . . ., 59,58
(s + 1), s = 1,0; 2,1; 3,2; ...; 59,58
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 59. Reliability Curves for n = 59. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1, 3,2; . . ; 60,59
(s + 1), s = 1 0; 2,1, 3,2; . . ; 60,59
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 60. Reliability Curves for n = 60. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1, 3,2, ..., 61 60
(s + 1), s = 1 0; 2,1; 3,2; . . , 61 60
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − $C(p_u)$

Figure 63. Reliability Curves for n = 61. (s numbers on curves; for p_u, values are 1 less.)

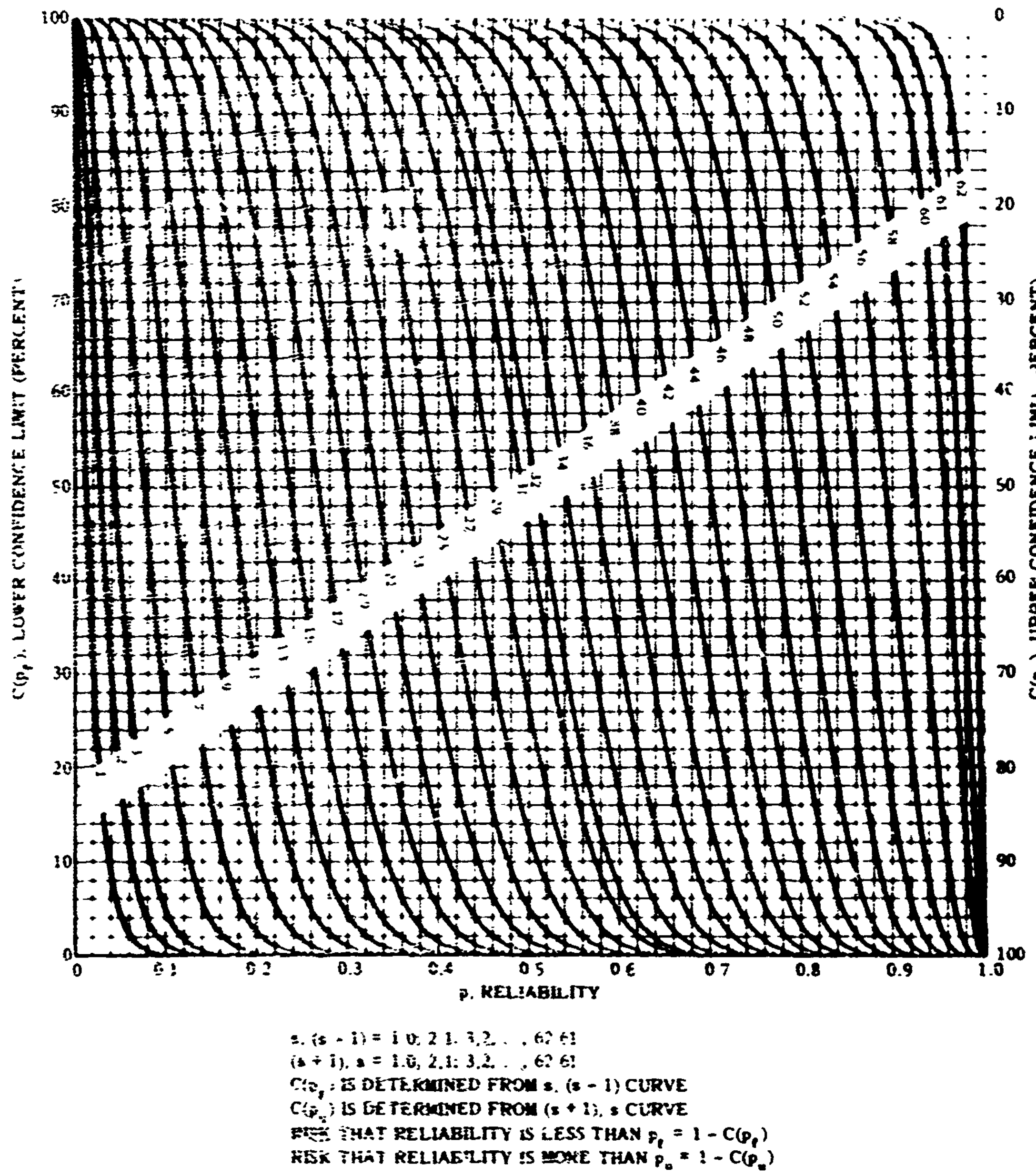
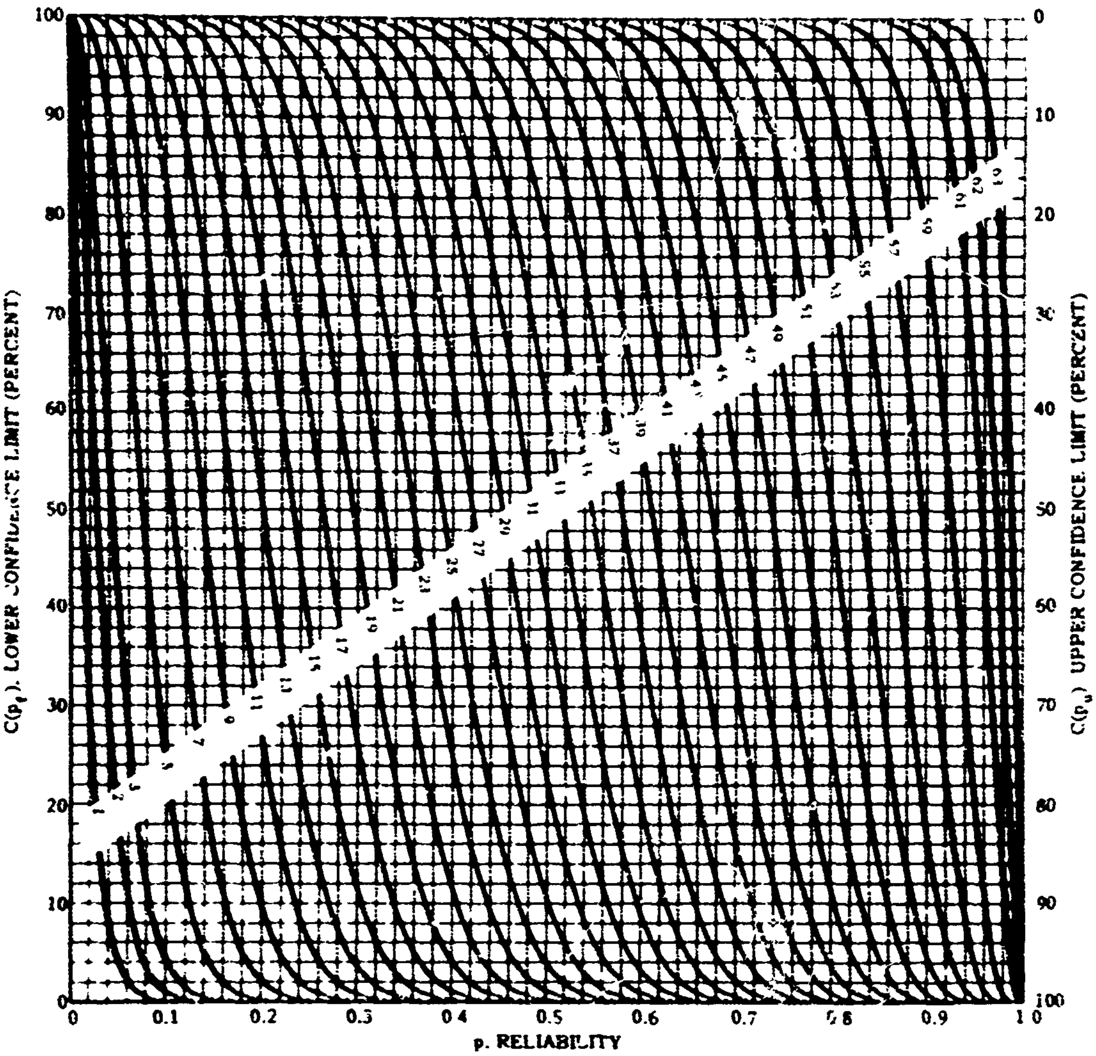
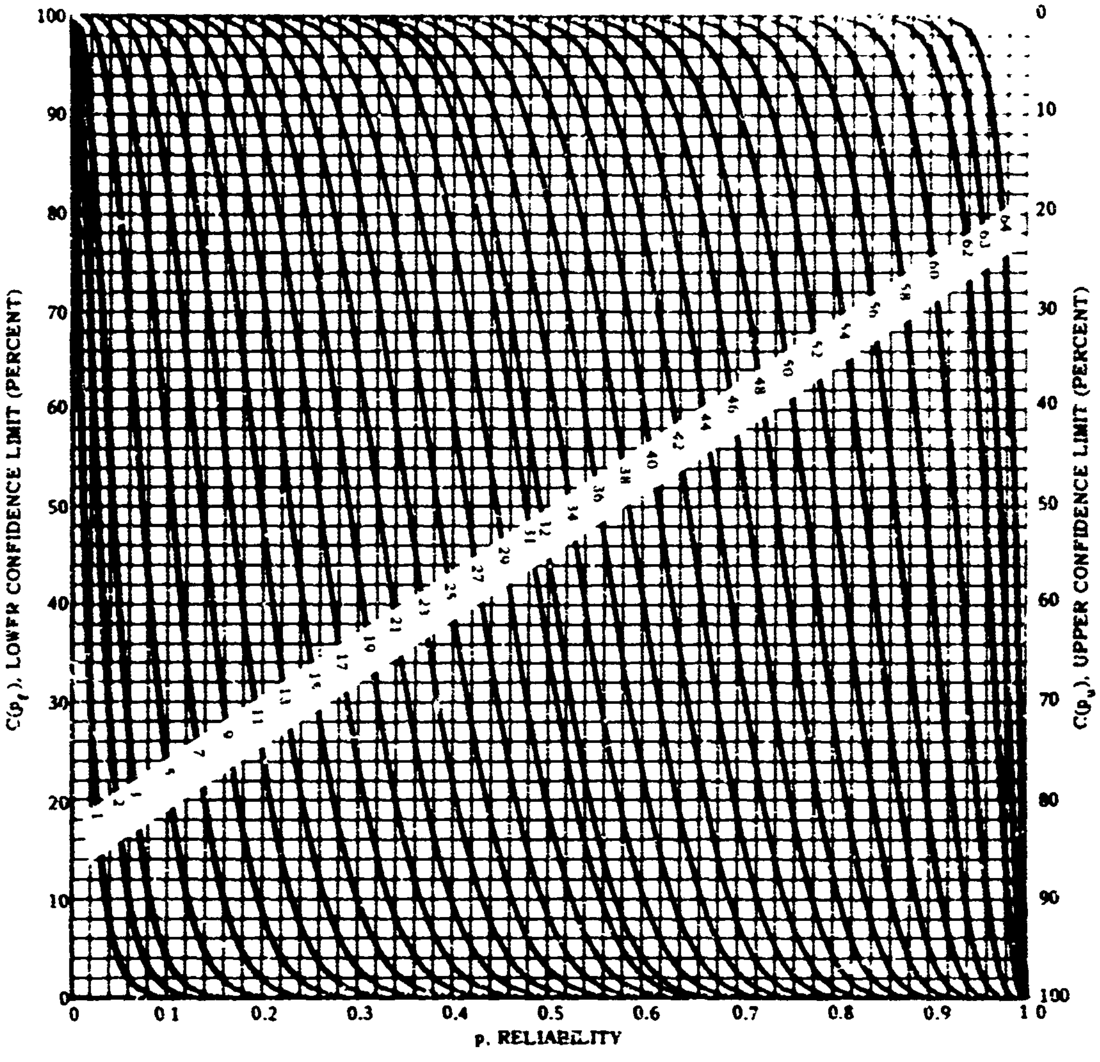


Figure 62. Reliability Curves for n = 62. (s numbers on curves; for p_u, values are 1 less.)



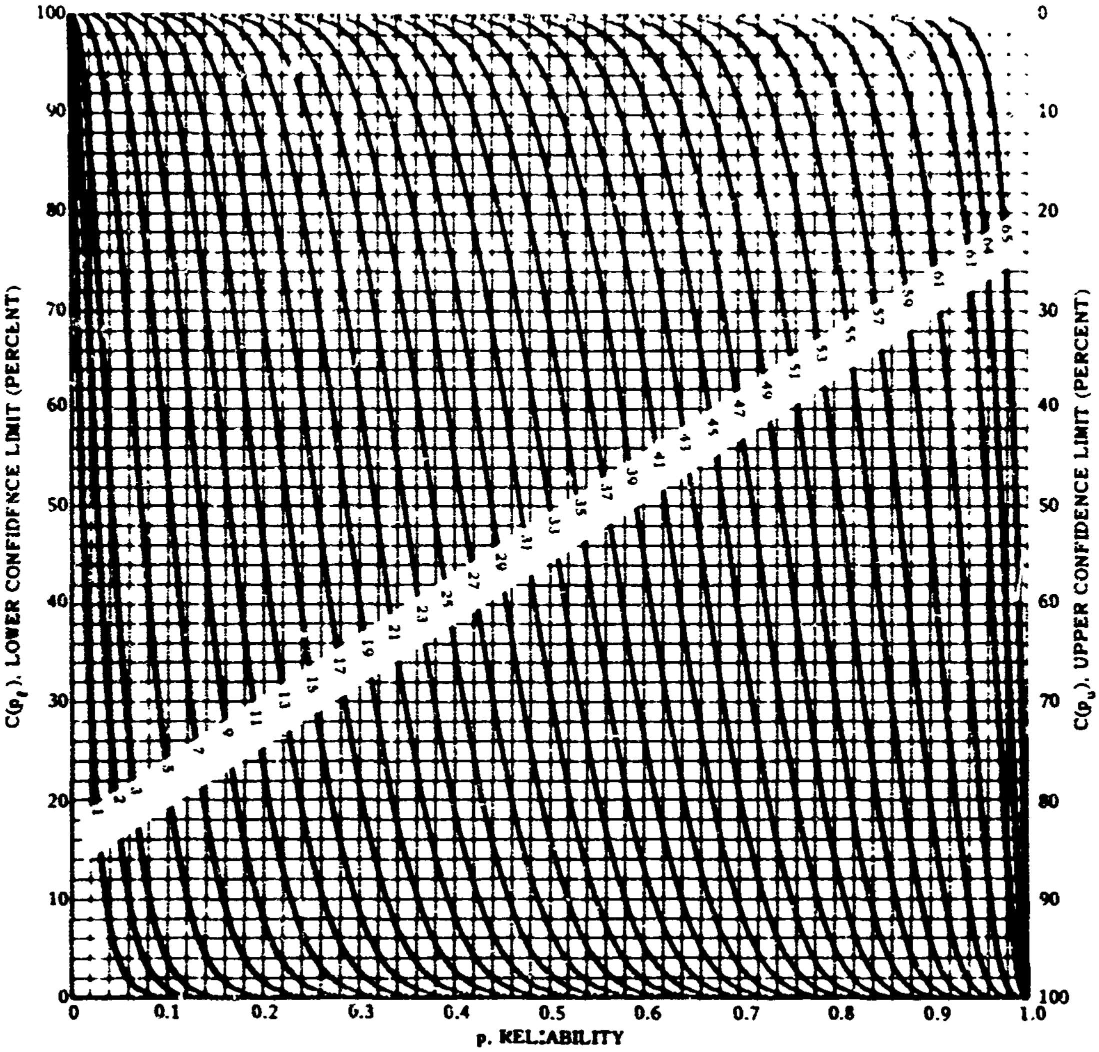
s, (s − 1) = 1,0; 2,1, 3,2, ..., 63,62
(s + 1), s = 1,0; 2,1; 3,2; ..., 63,62
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 63. Reliability Curves for $n = 63$. (s numbers on curves; for p_u, values are 1 less.)



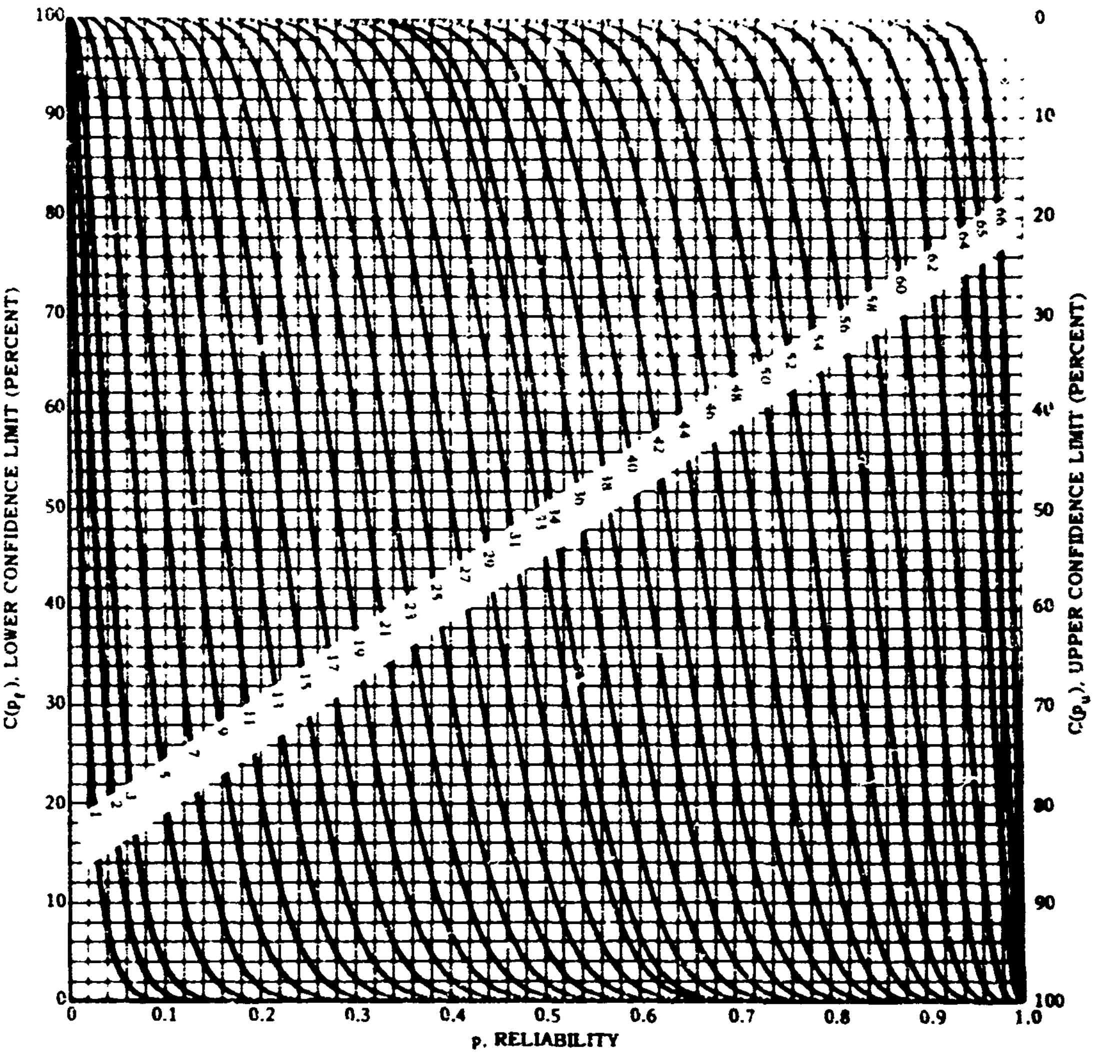
s, (s − 1) = 1,0; 2,1; 3,2; ..., 64,63
(s + 1), s = 1,0; 2,1; 3,2; ...; 64,63
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 64 Reliability Curves for n = 64. (s numbers on curves; for p_u, values are 1 less.)



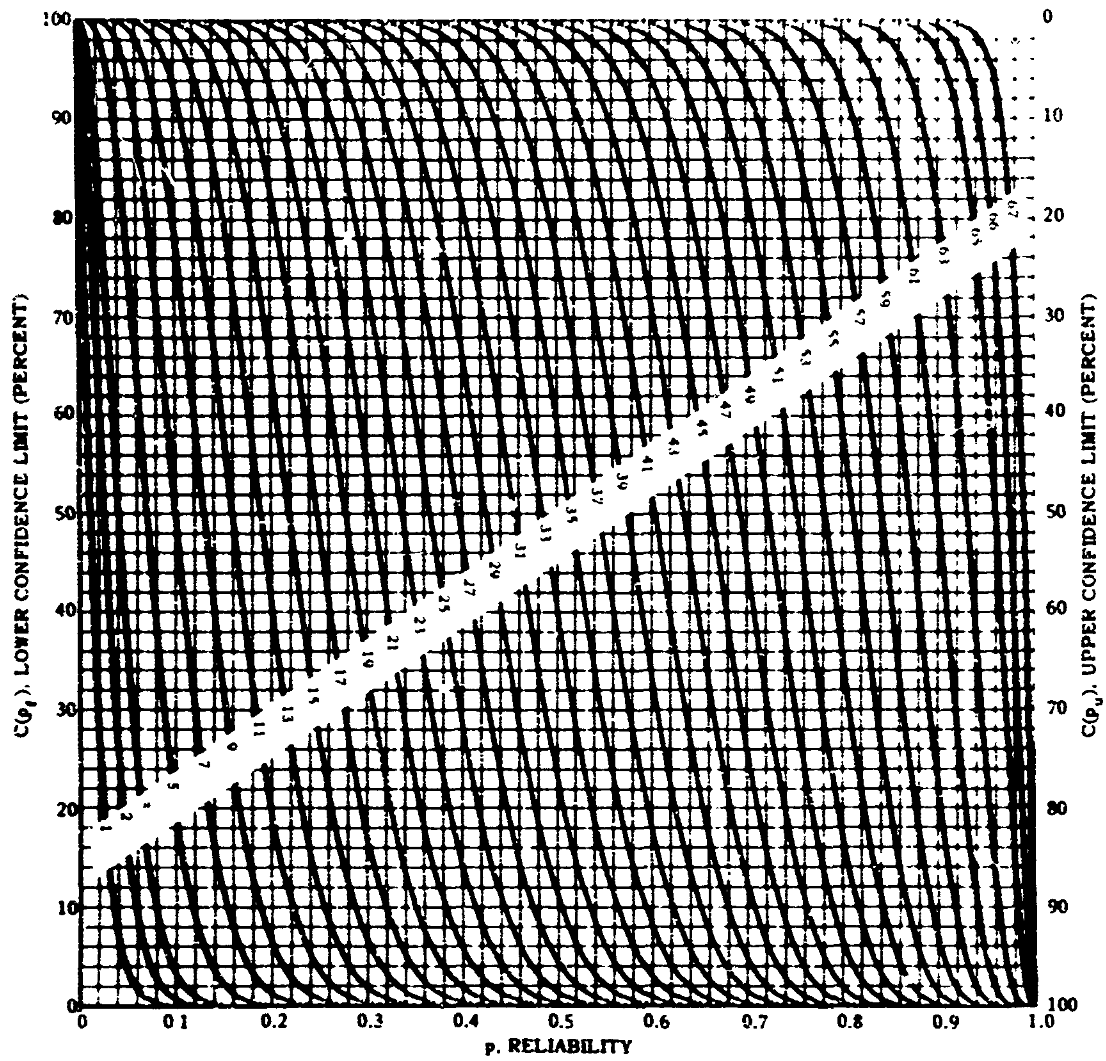
s, (s − 1) = 1,0; 2,1; 3,2; ...; 65,64
(s + 1), s = 1,0; 2,1; 3,2; ...; 65,64
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 65. Reliability Curves for n = 65. (s numbers on curves; for p_u, values are 1 less.)



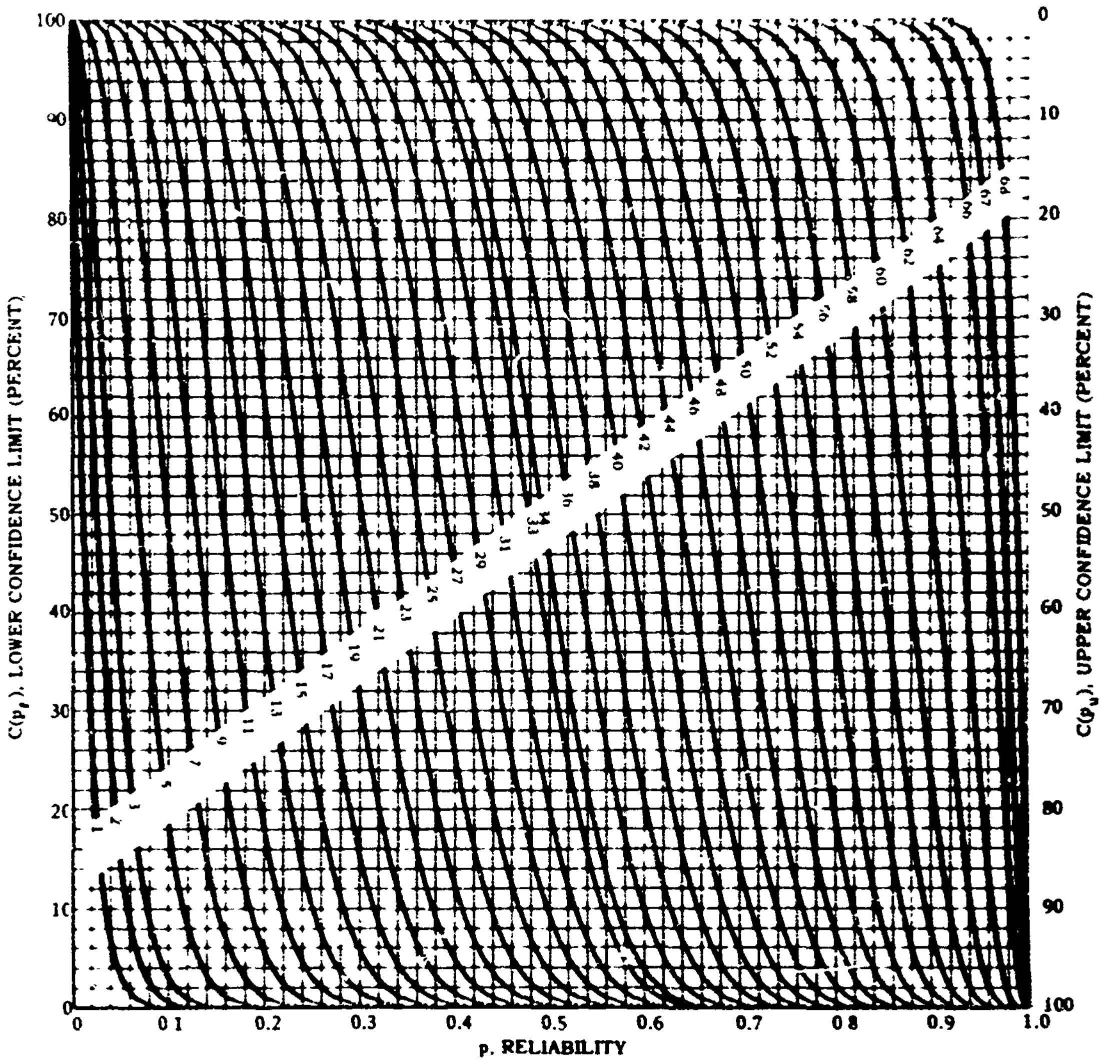
s, (s − 1) = 1,0; 2,1, 3,2, ..., 66,65
(s + 1), s = 1,0; 2,1, 3,2, ..., 66,65
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 66. Reliability Curves for n = 66. (s numbers on curves; for p_u: values are 1 less.)



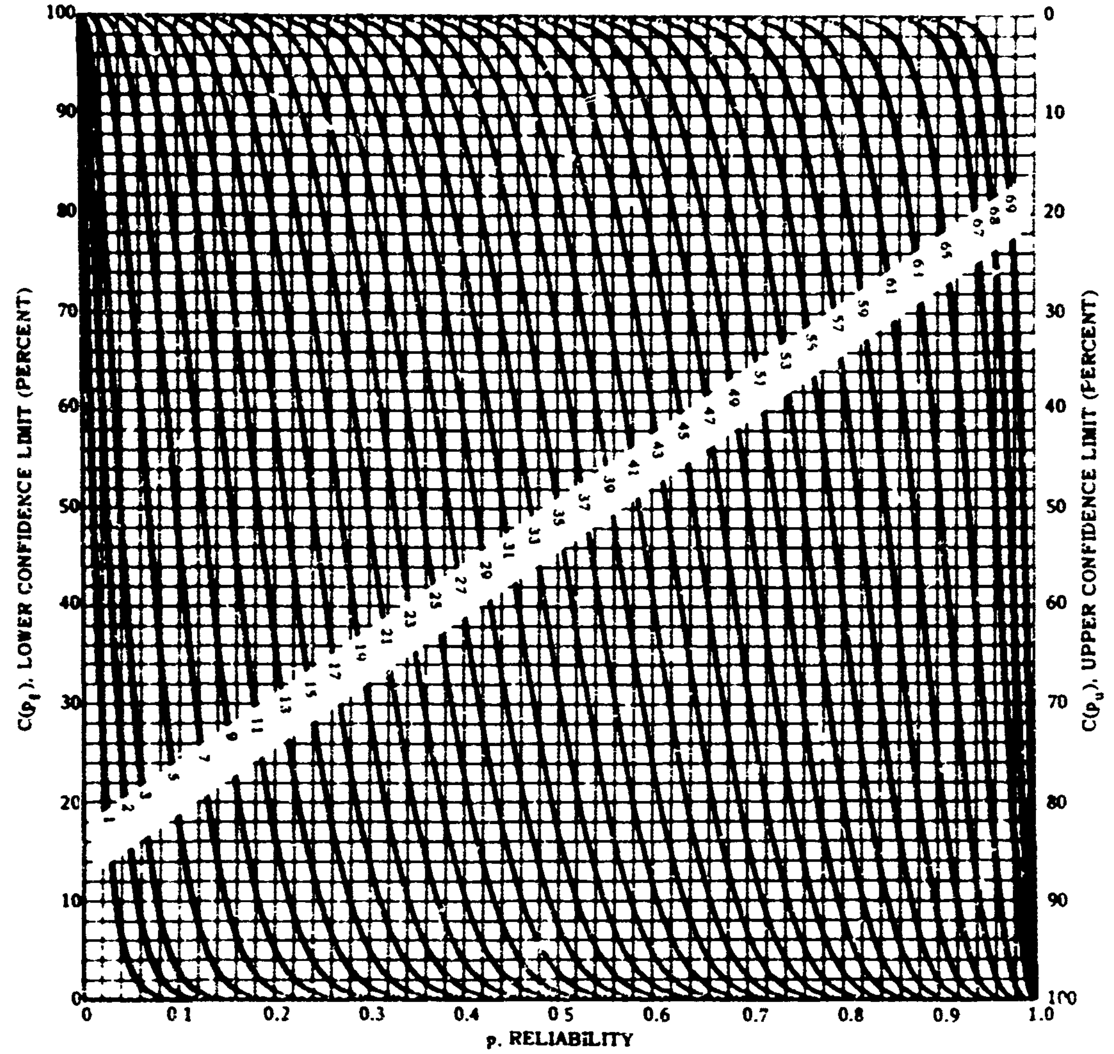
s (s − 1) = 1,0; 2,1; 3,2; ...; 67,66
(s + 1), s = 1,0; 2,1; 3,2; ...; 67,66
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 67. Reliability Curves for n = 67. (s numbers on curves; for p_u, values are 1 less.)



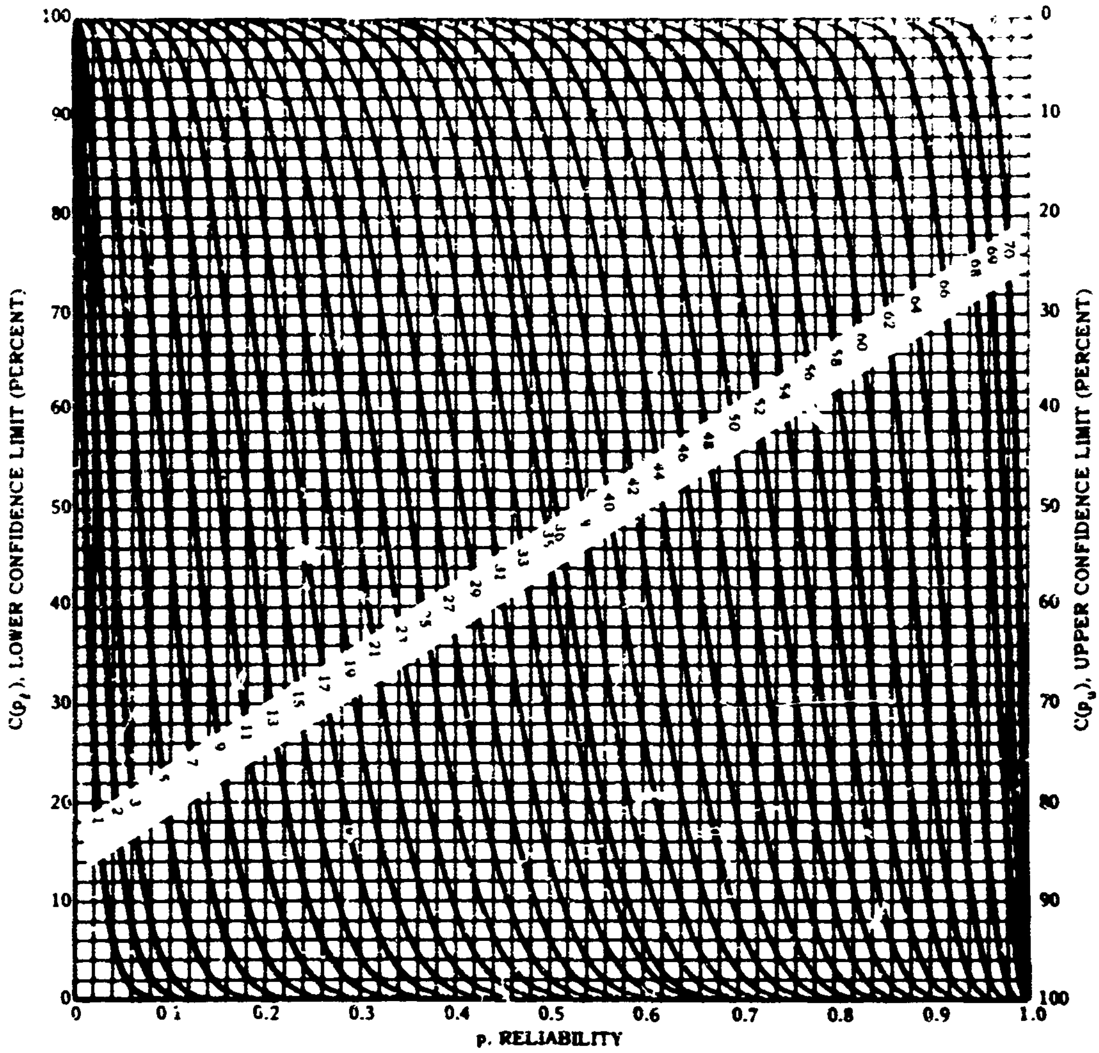
s, (s - 1) = 1,0; 2,1; 3,2; ...; 68,67
(s + 1), s = 1,0; 2,1; 3,2, ..., 68,67
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 68. Reliability Curves for n = 68. (s numbers on curves; for p_u, values are 1 less.)



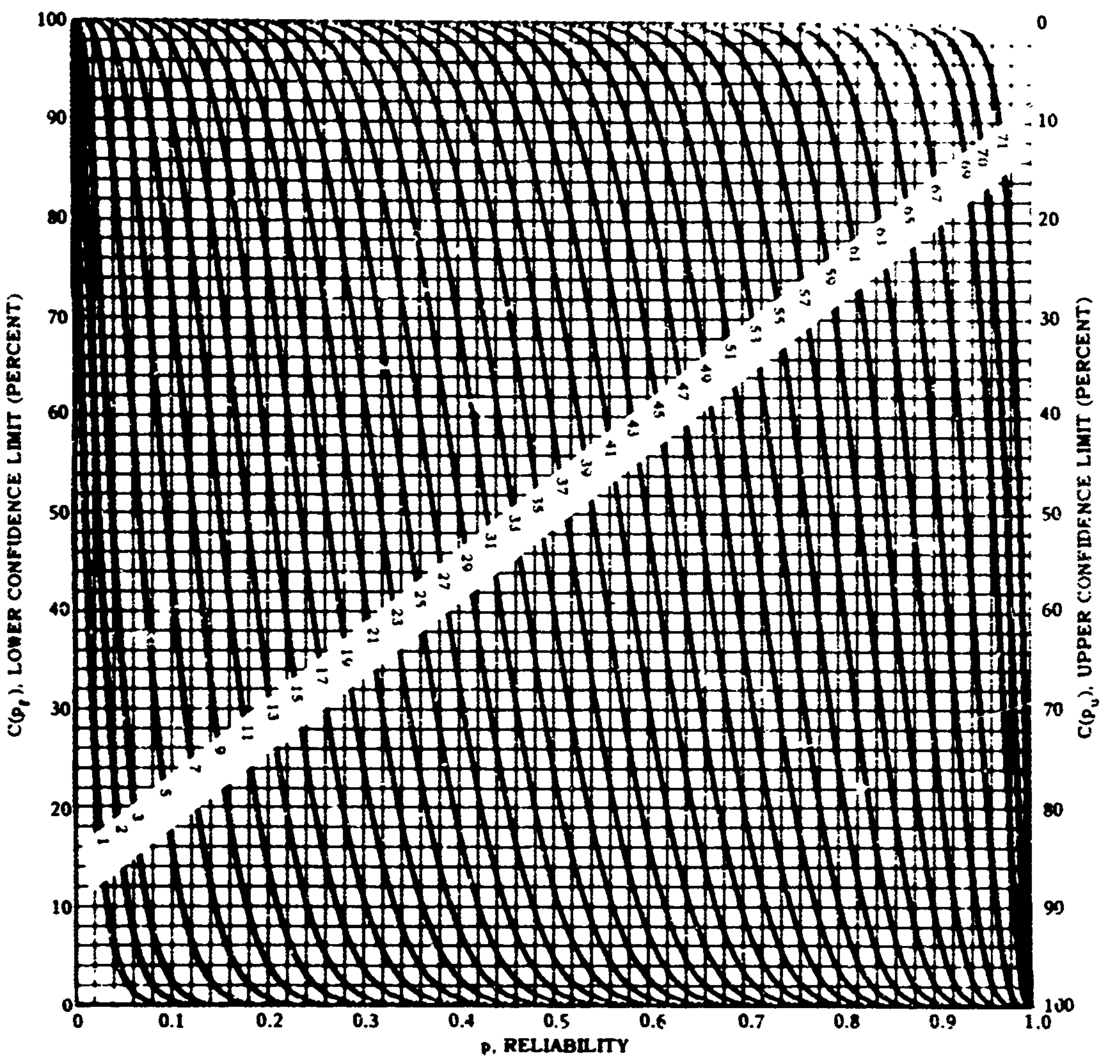
s, (s - 1) = 1,0; 2,1, 3,2, ... 69,68
(s + 1), s = 1,0; 2,1, 3,2, ..., 69,68
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 69. Reliability Curves for n = 69. (s numbers on curves; for p_u, values are 1 less.)



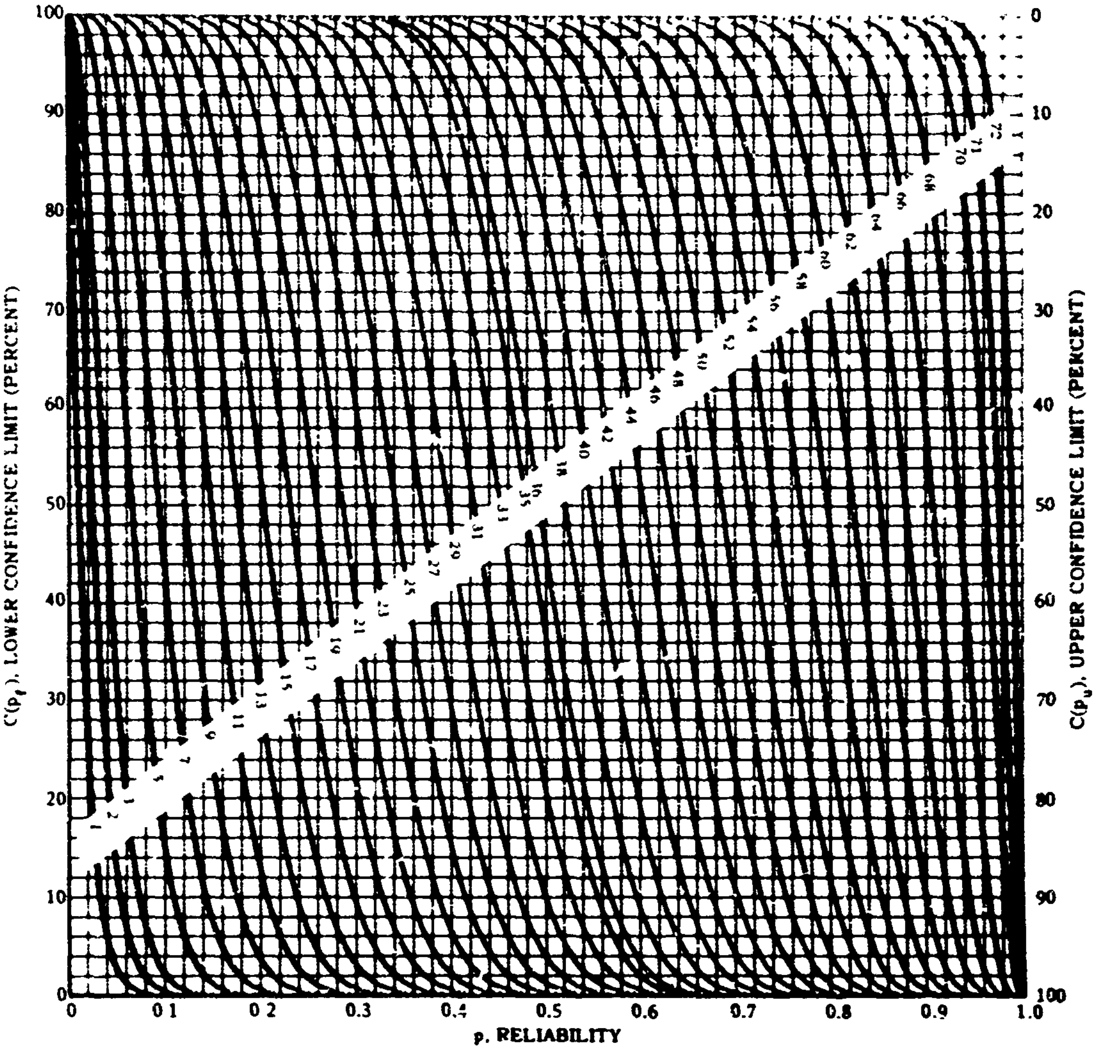
s, (s − 1) = 1,0; 2,1; 3,2; ... ; 70,69
(s + 1), s = 1,0; 2,1; 3,2; ... ; 70,69
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 70. Reliability Curves for n = 70. (s numbers on curves; for p_u, values are 1 less.)



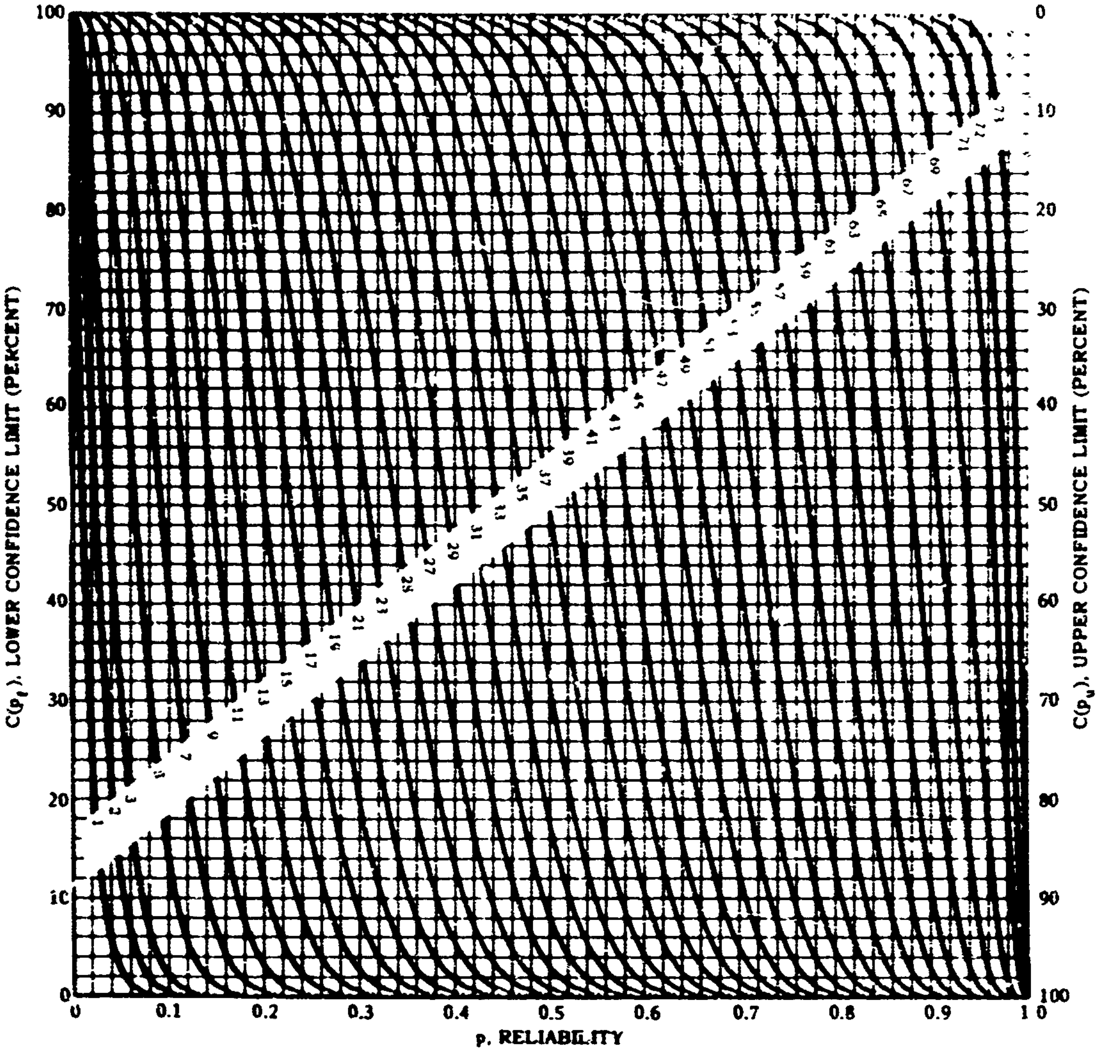
s, (s - 1) = 1,0; 2,1; 3,2; . . ., 71,70
(s + 1), s = 1,0; 2,1; 3,2; . . .; 71,70
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = $1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = $1 - C(p_u)$

Figure 71. Reliability Curves for n = 71. (s numbers on curves; for p_u, values are 1 less.)



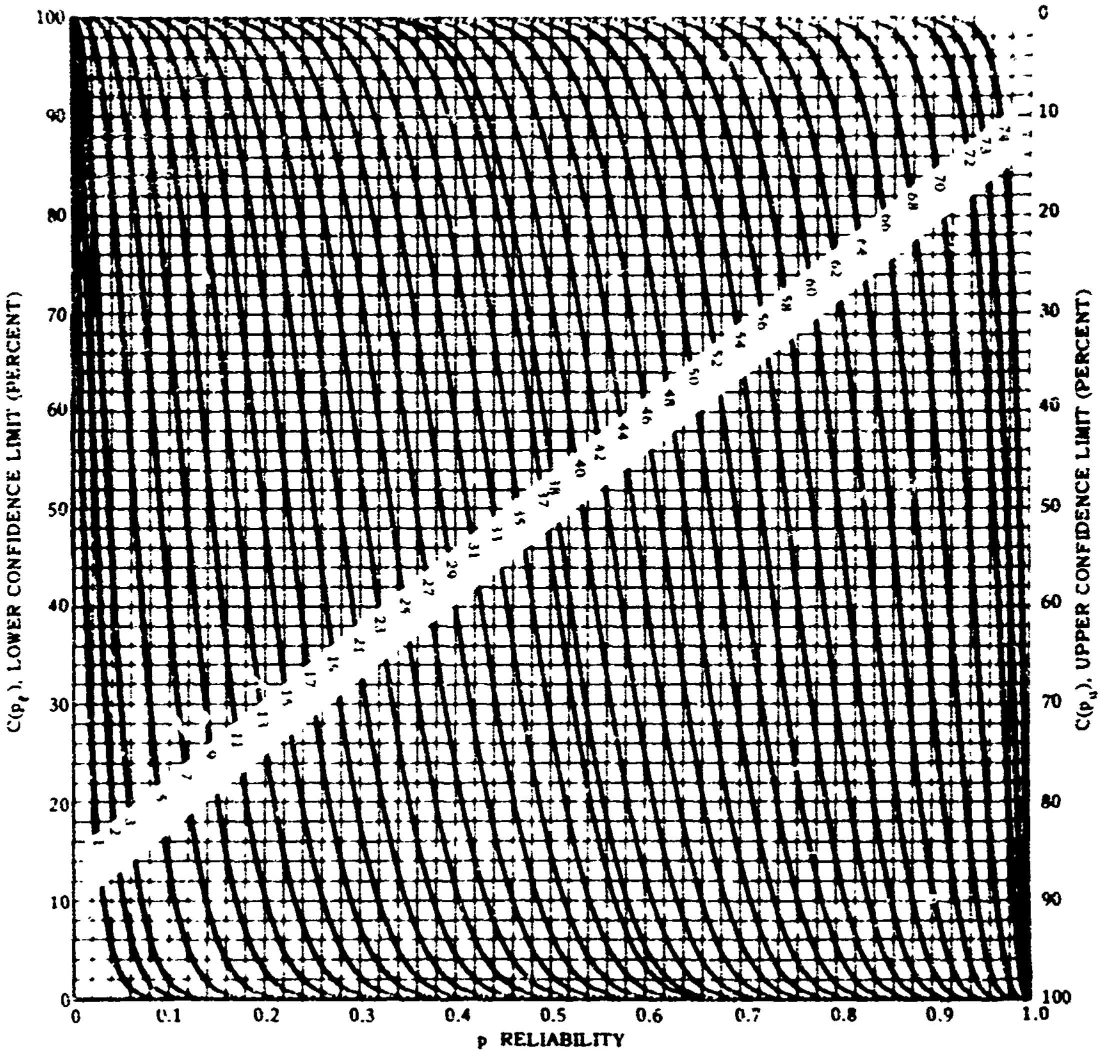
s, (s − 1) = 1,0, 2,1, 3,2; ..., 72,71
(s + 1), s = 1,0; 2,1; 3,2; . . .; 72,71
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 72. Reliability Curves for n = 72. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2; . . ; 73,72
(s + 1), s = 1,0; 2,1; 3,2; . . ; 73,72
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 73. Reliability Curves for n = 73. (s numbers on curves; for p_u, values are 1 less.)



$s, (s-1) = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 74,73$

$(s+1), s = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 74,73$

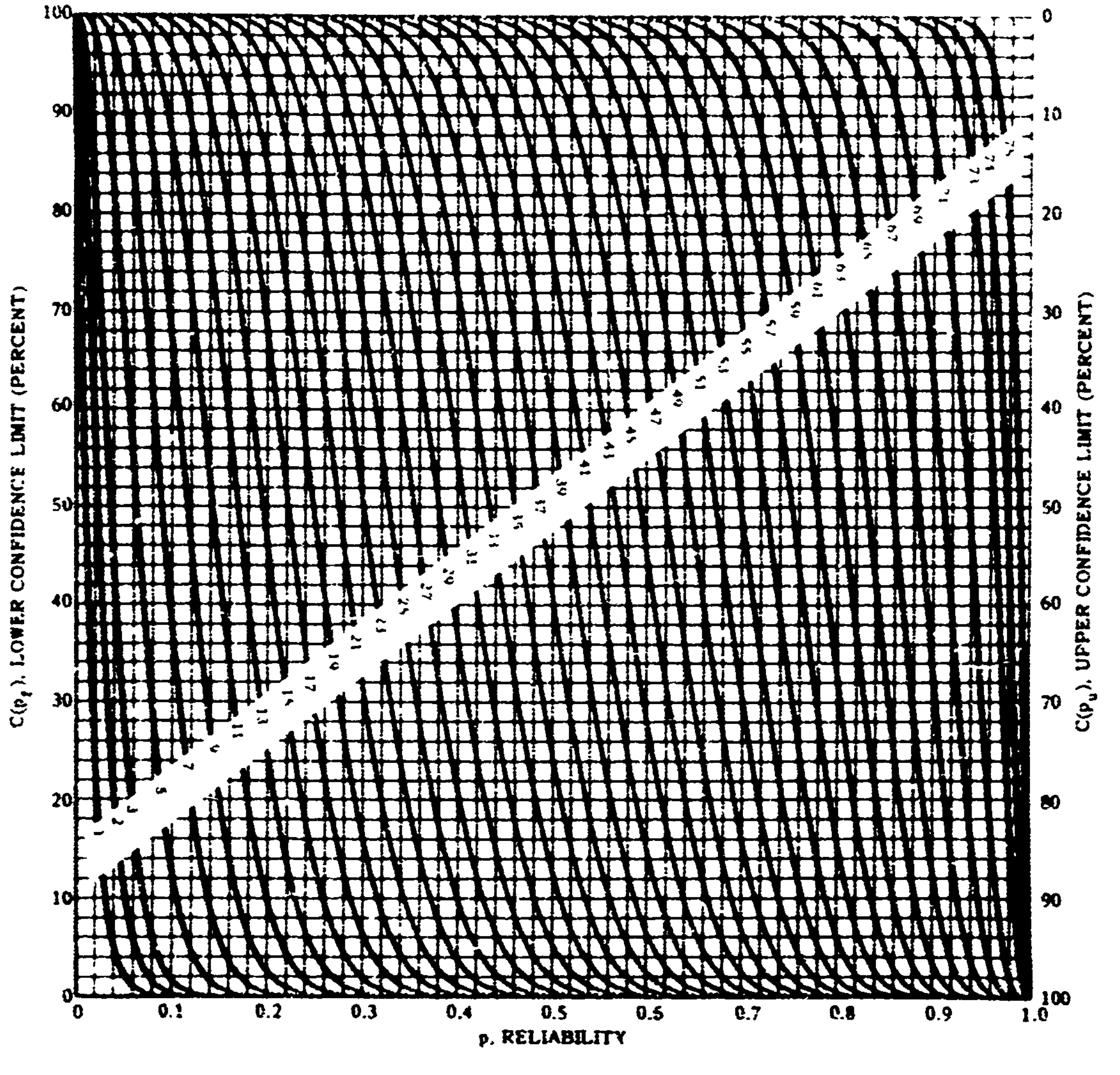
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

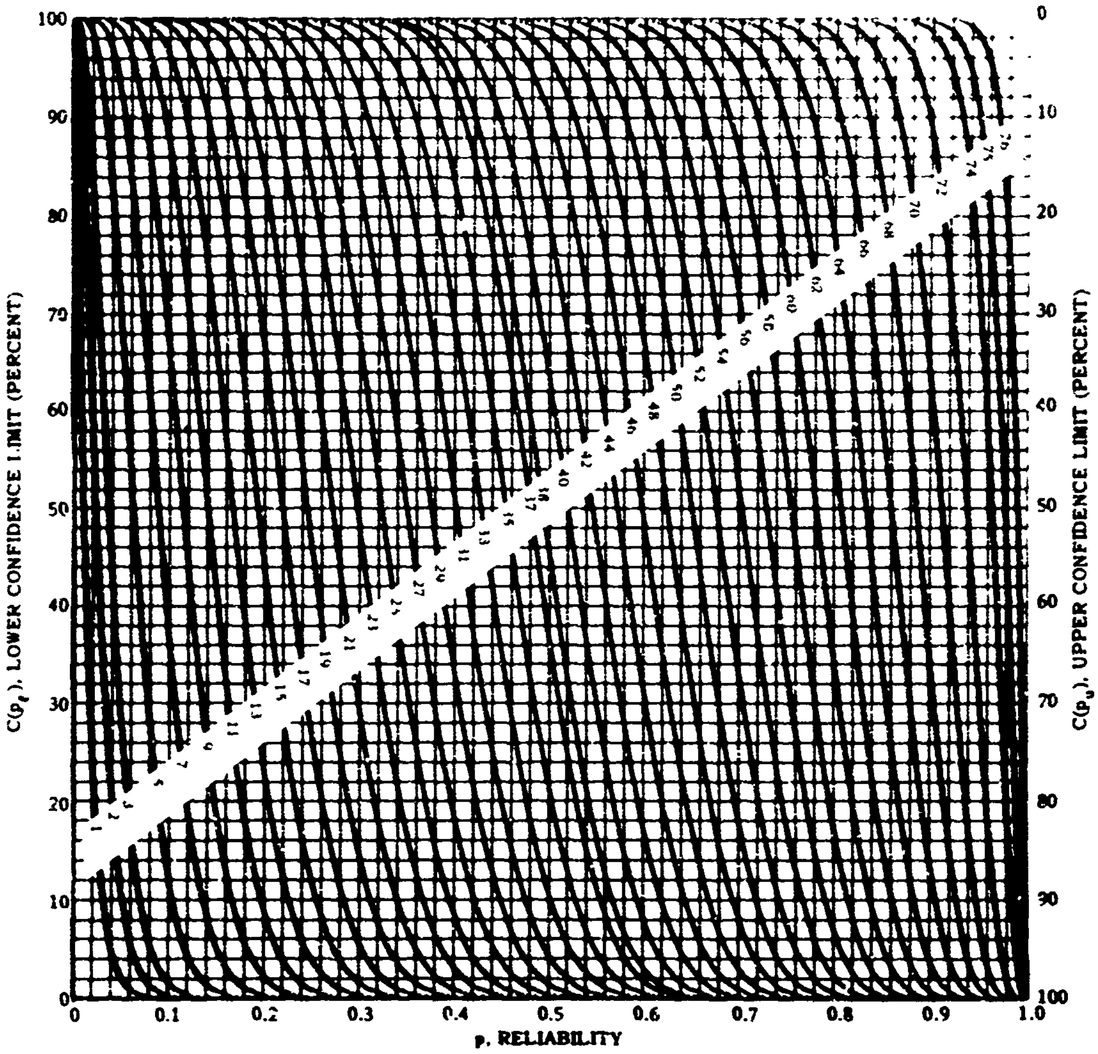
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 74. Reliability Curves for n = 74. (s numbers on curves; for p_u, values are 1 less.)



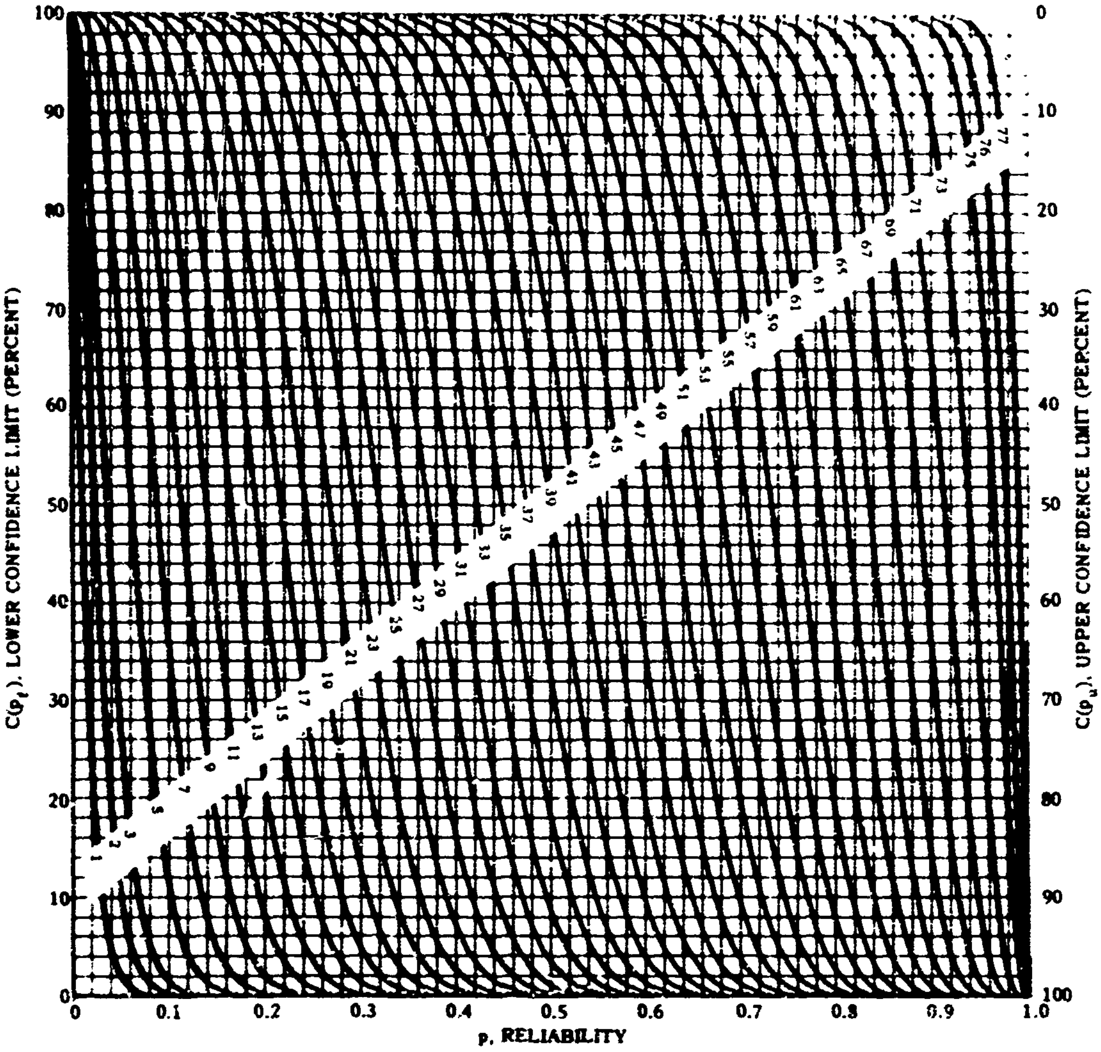
s, (s - 1) = 1,0; 2,1; 3,2; . . ., 75,74
(s + 1), s = 1,0; 2,1, 3,2; . . .; 75,74
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 75. Reliability Curves for n = 75. (s numbers on curves; for p_u, values are 1 less.)



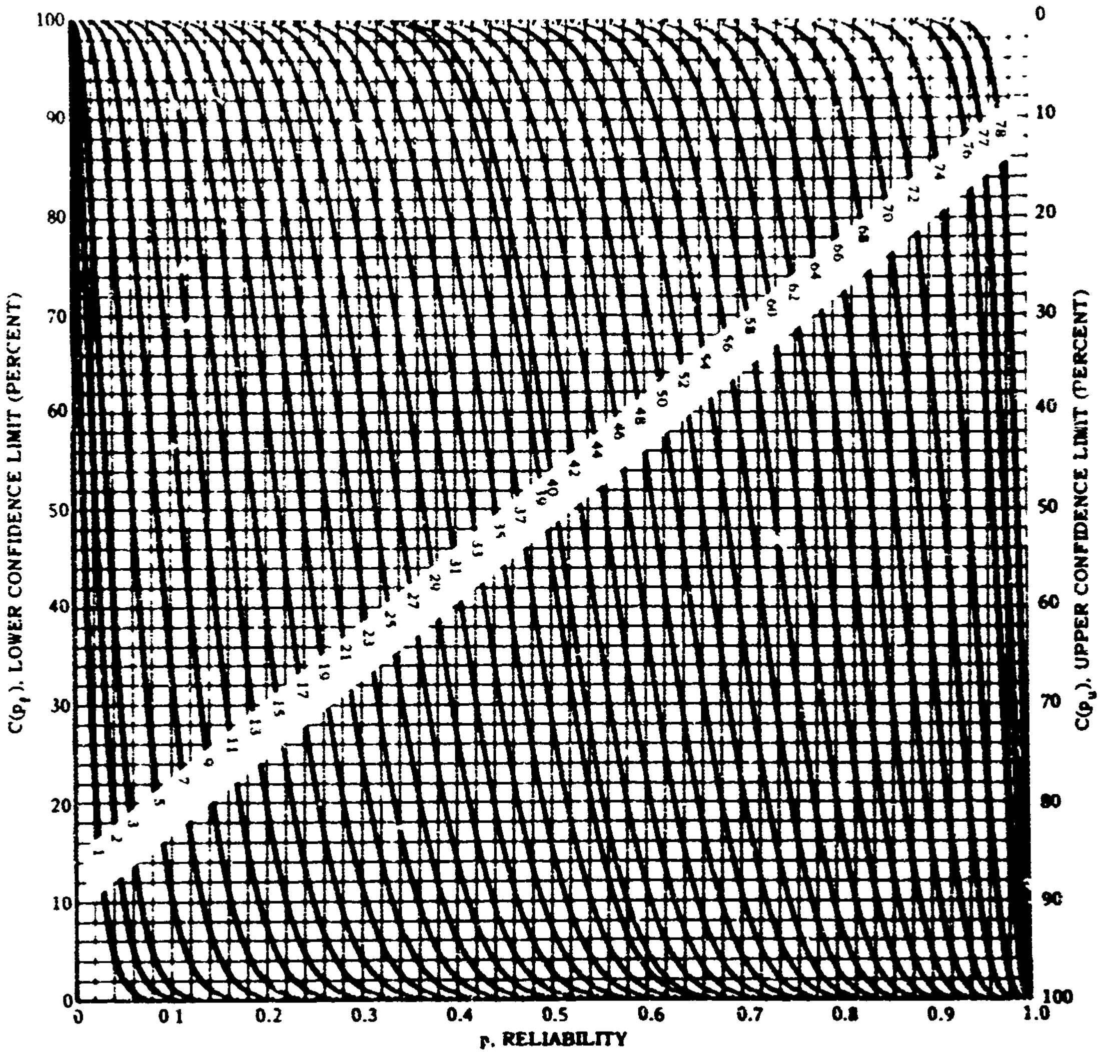
s, (s − 1) = 1,0; 2,1; 3,2; . . .; 76,75
(s + 1), s = 1 0; 2,1; 3,2; ...; 76,75
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 76. Reliability Curves for n = 76. (s numbers on curves; for p_u, values are 1 less.)



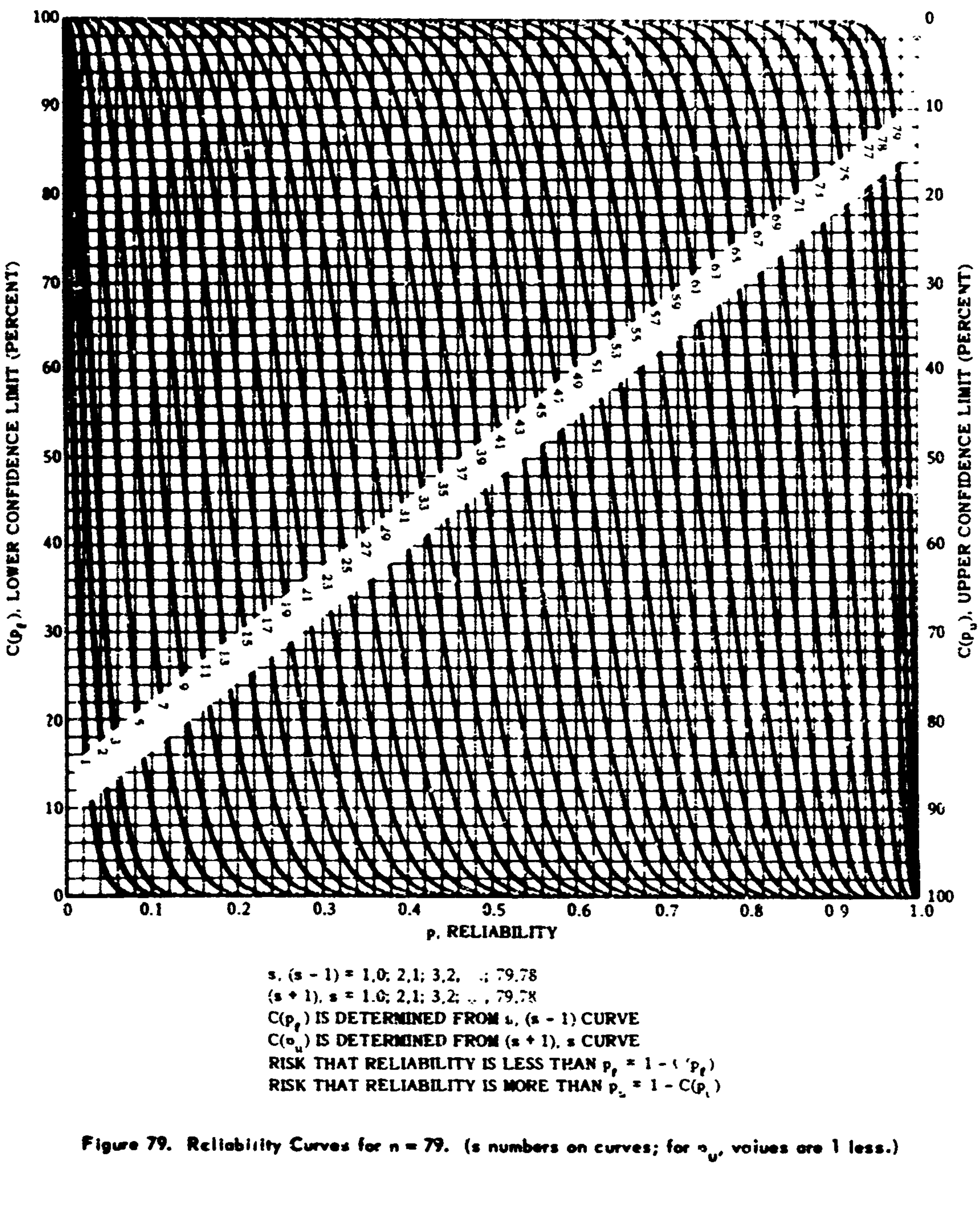
s, (s − 1) = 1,0; 2,1; 3,2; ..., 77,76
(s + 1), s = 1,0; 2,1; 3,2; ...; 77,76
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 77. Reliability Curves for n = 77. (s numbers on curves; for p_u, values are 1 less.)



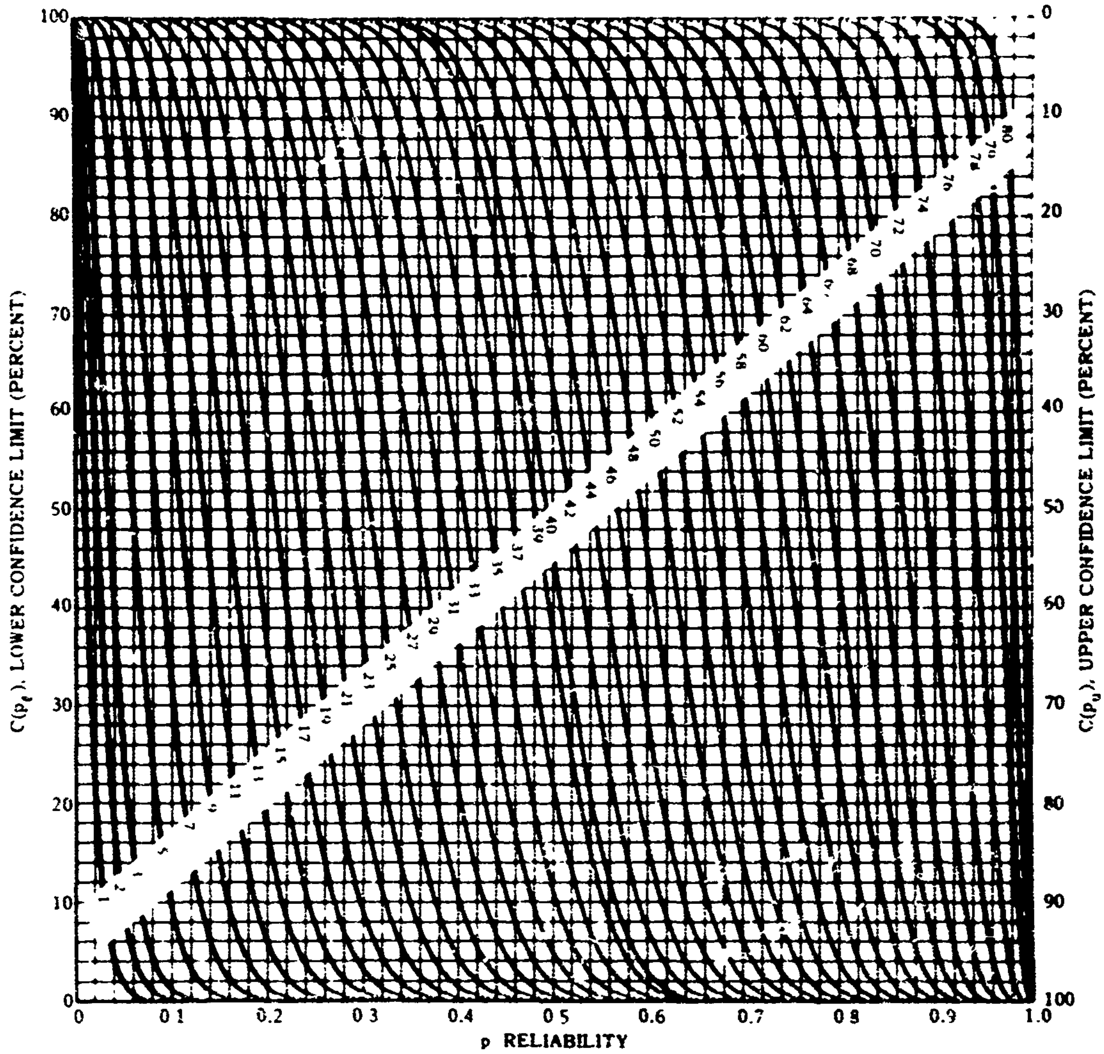
s, (s - 1) = 1,0; 2,1; 3,2; ..., 78,77
(s + 1), s = 1,0; 2,1; 3,2; ..., 78,77
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 78. Reliability Curves for n = 78. (s numbers on curves; for p_u, values are 1 less.)



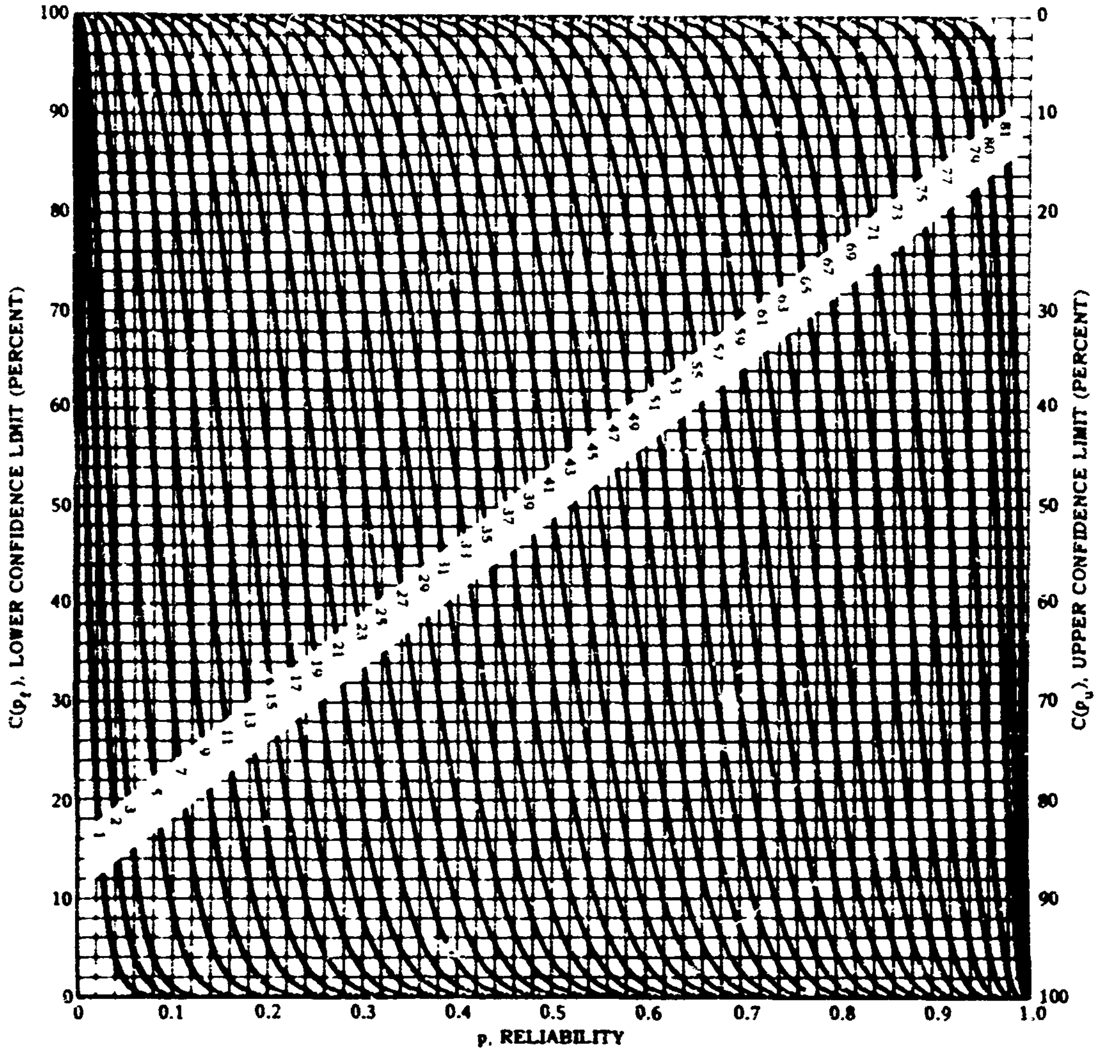
s, (s - 1) = 1,0; 2,1; 3,2, ...; 79,78
(s + 1), s = 1,0; 2,1; 3,2; ... , 79,78
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 79. Reliability Curves for n = 79. (s numbers on curves; for p_u, values are 1 less.)



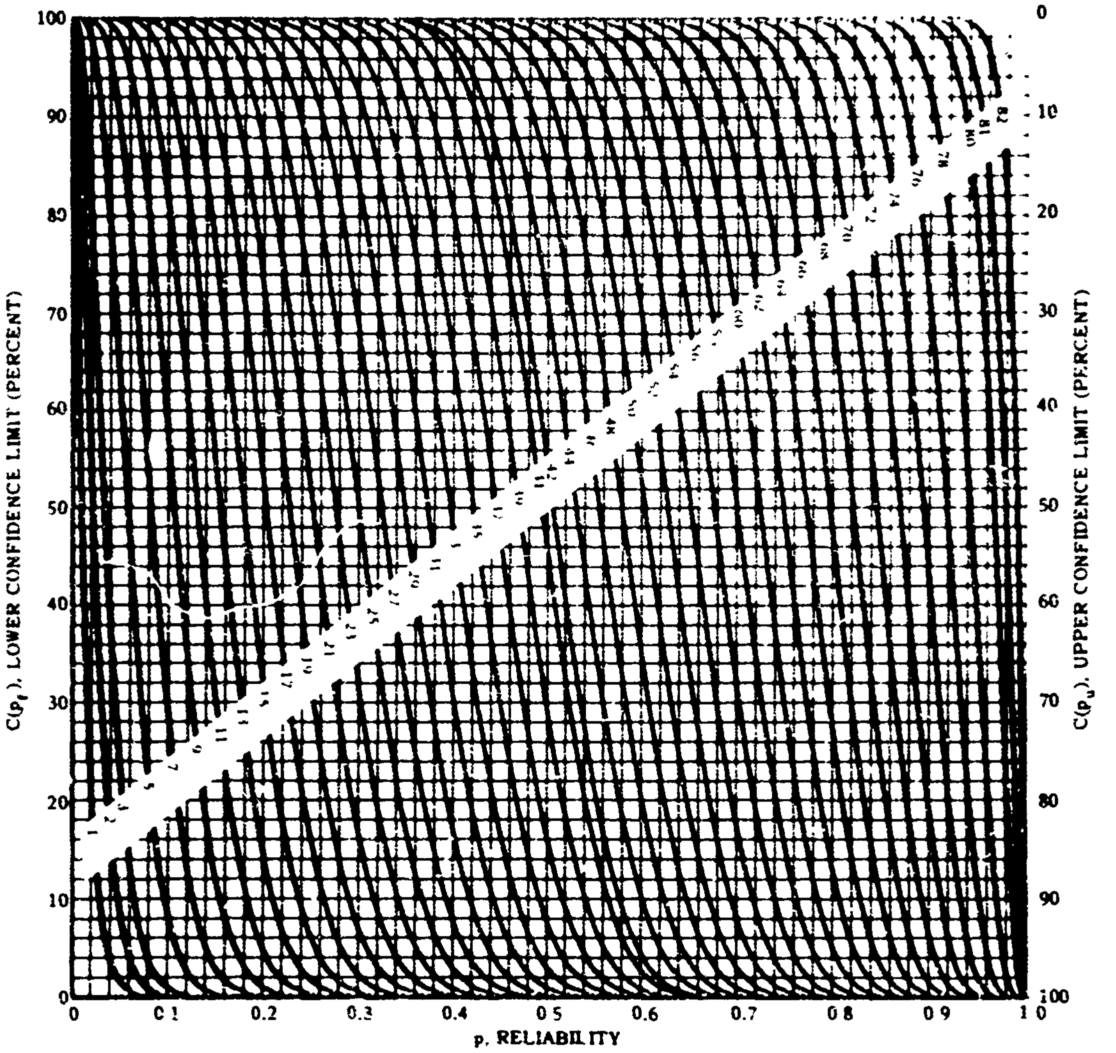
s, (s − 1) = 1,0; 2,1; 3,2; . . . , 80,79
(s + 1), s = 1,0; 2,1; 3,2; . . . , 80,79
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 80. Reliability Curves for n = 80. (s numbers on curves; for p_u, values are 1 less.)



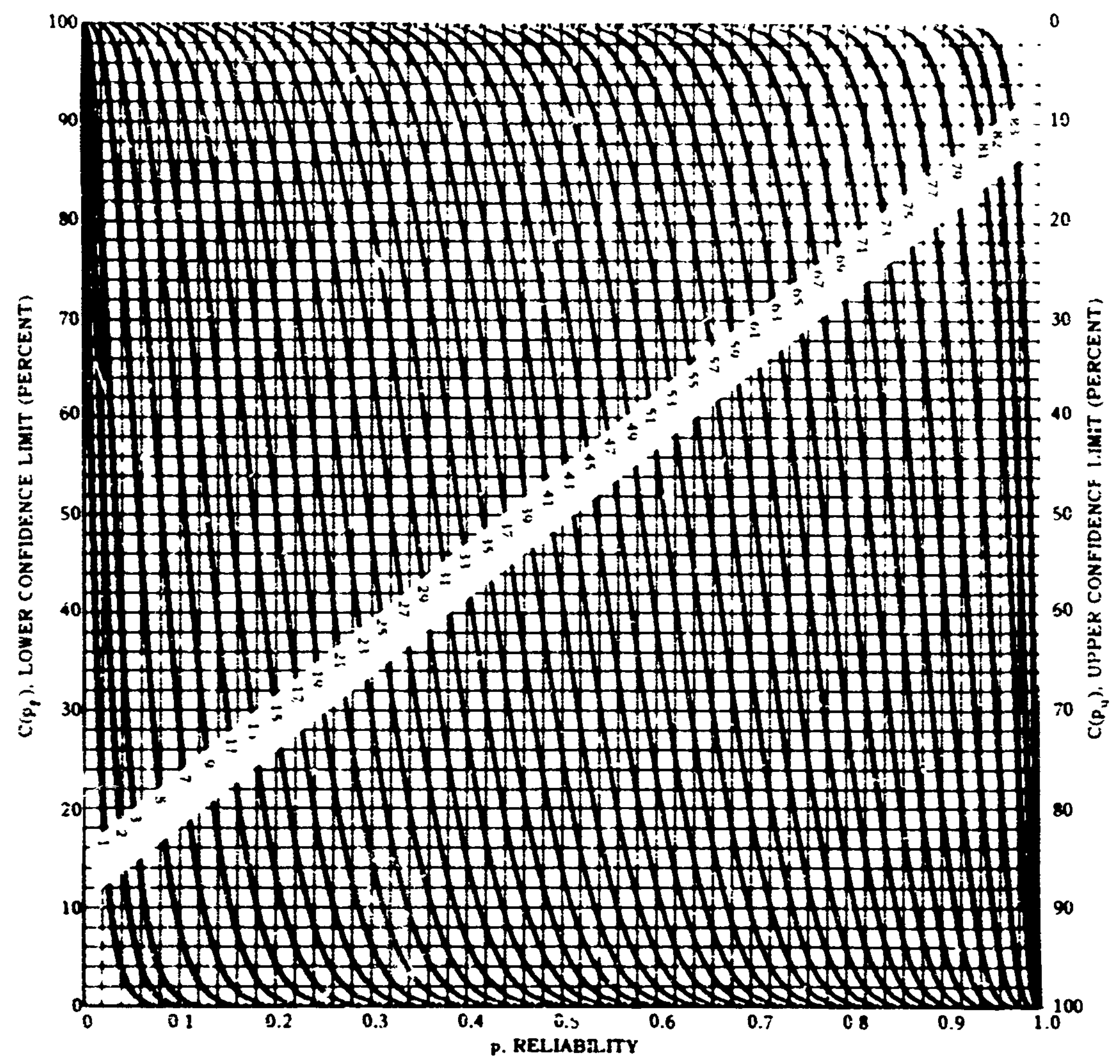
s, (s − 1) = 1,0; 2,1 3,2; ...; 81,80
(s + 1), s = 1,0; 2,1: 3,2; ...; 81,80
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 81. Reliability Curves for n = 81. (s numbers on curves; for p_u, values are 1 less.)



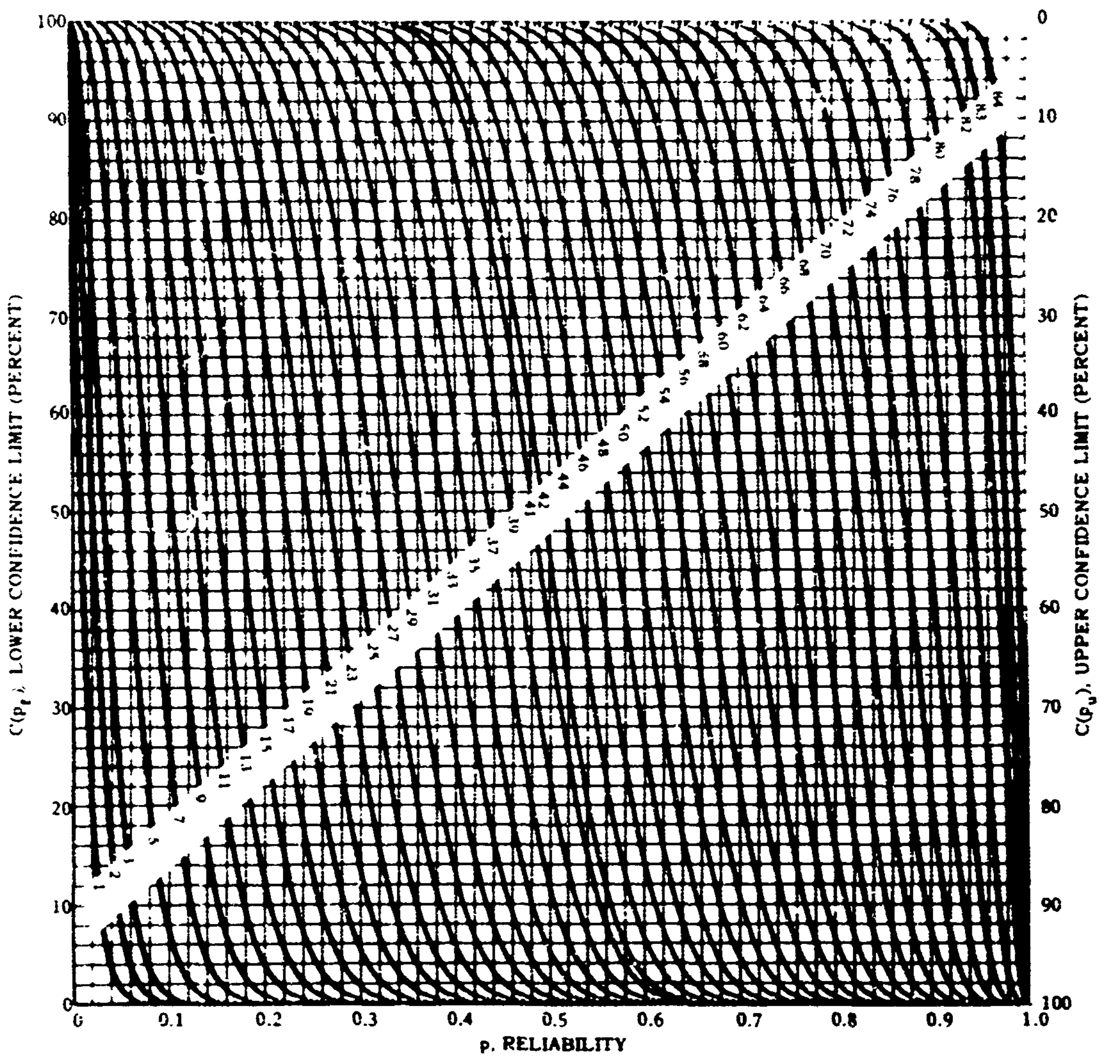
s (s - 1) = 1,0; 2,1, 3,2, ..., 82 81
(s + 1), s = 1 0, 2,1, 3,2, . . , 82 81
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 82. Reliability Curves for n = 82. (s numbers on curves; for p_u, values are 1 less.)



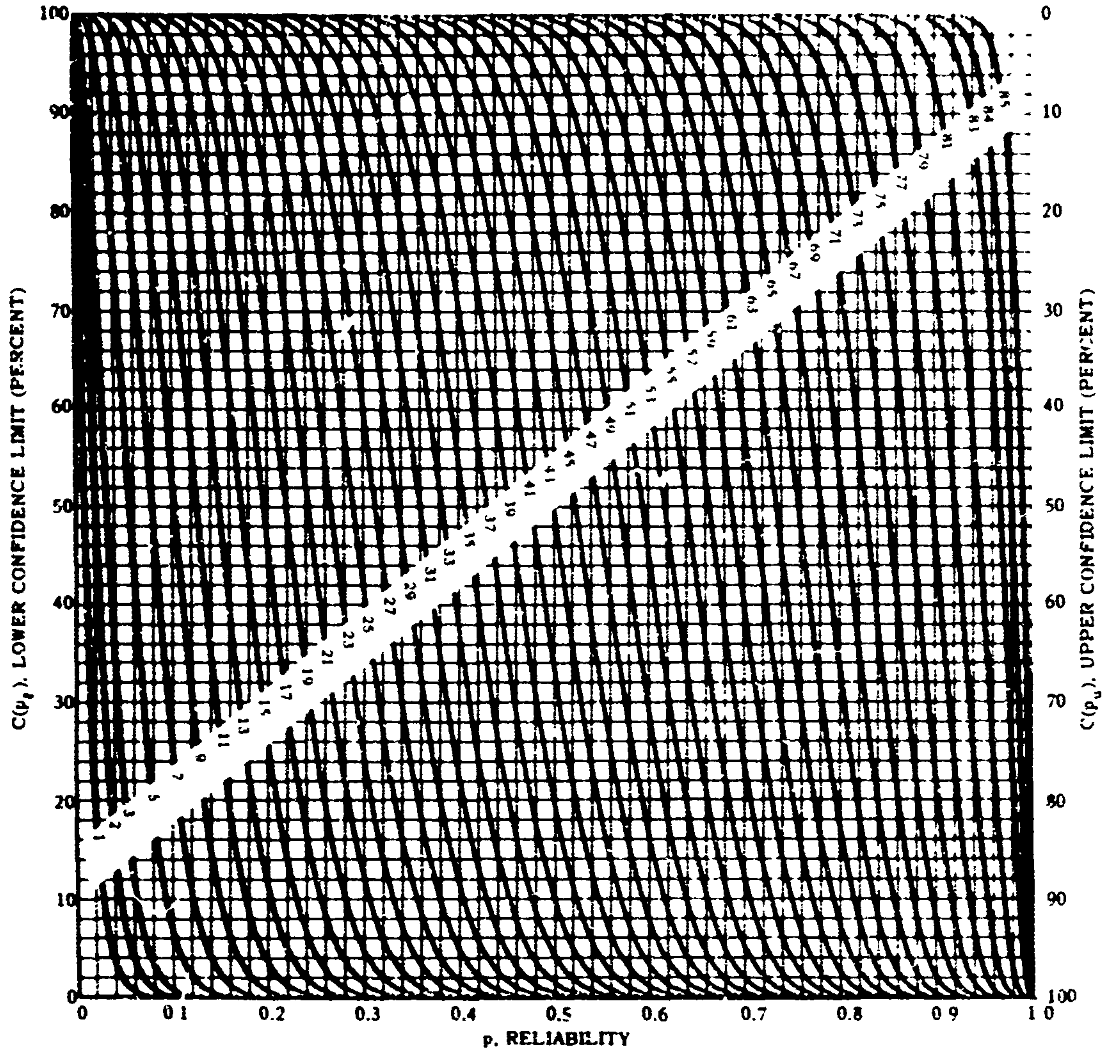
s, (s - 1) = 1,0; 2,1; 3,2, ..., 83,82
(s + 1), s = 1,0; 2,1; 3,2, ..., 83,82
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 83. Reliability Curves for n = 83. (s numbers on curves; for p_u, values are 1 less.)



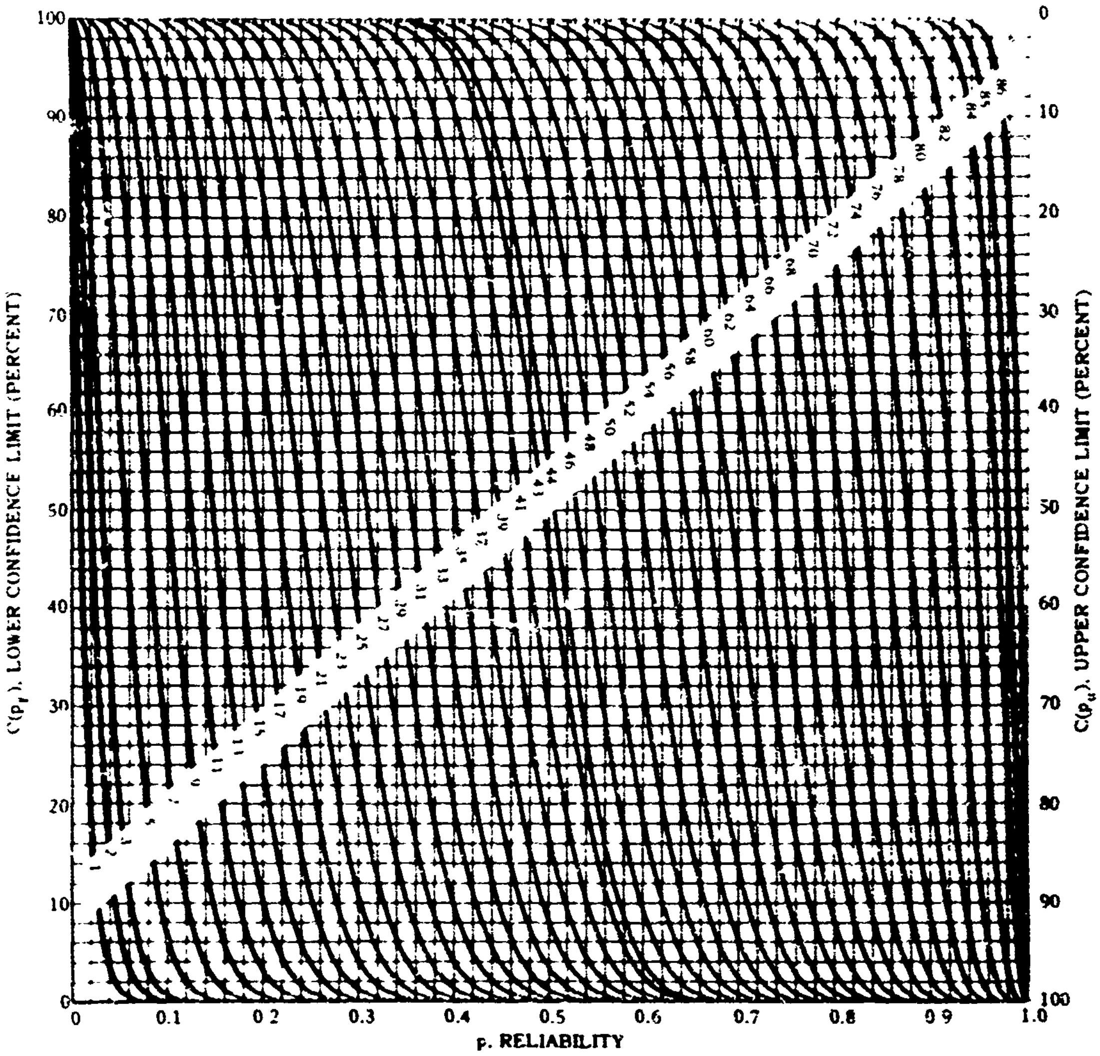
s, (s - 1) = 1,0; 2,1; 3,2, . . . , 84,83
(s + 1), s = 1,0; 2,1; 3,2, . . ., 84,83
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 84. Reliability Curves for n = 84. (s numbers on curves; for p_u, values are 1 less.)



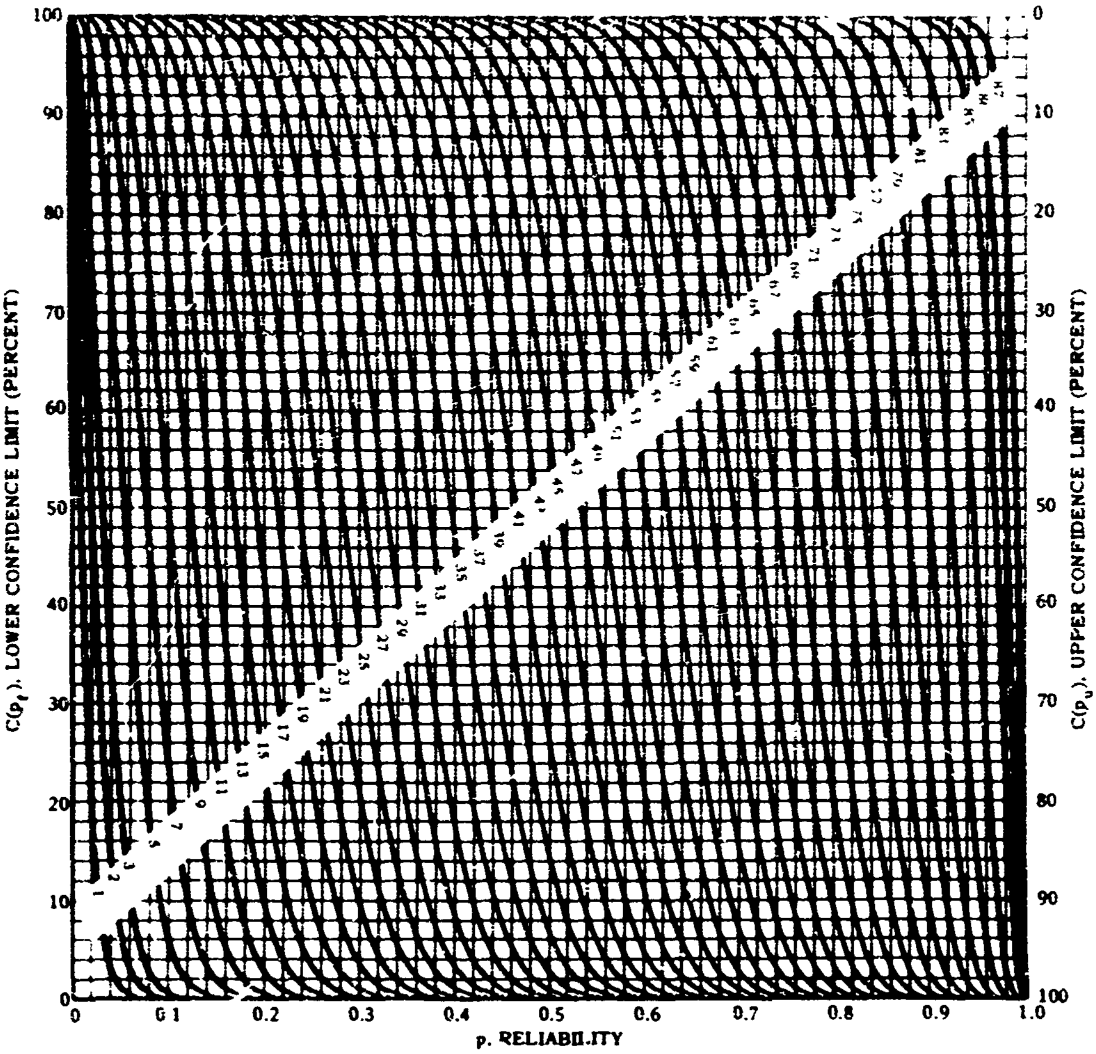
s, (s − 1) = 1,0; 2,1, 3,2, . . ., 85 84
(s + 1), s = 1 0, 2,1, 3,2, . . .; 85 84
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 85. Reliability Curves for n = 85. (s numbers on curves; for p_u, values are 1 less.)



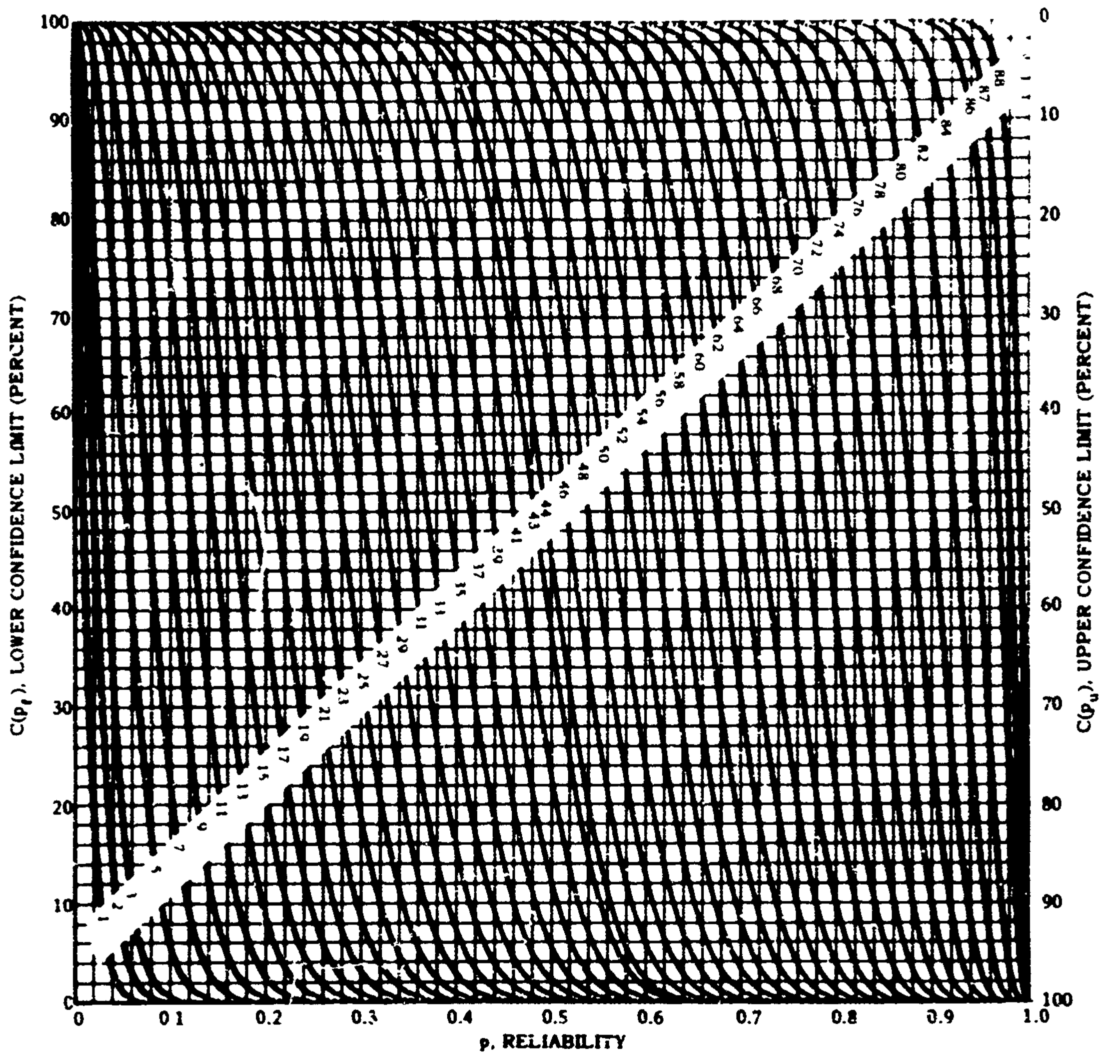
s, (s - 1) = 1,0; 2,1, 3,2, . . ., 86,85
(s + 1), s = 1,0; 2,1, 3,2, . . ., 86,85
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 86. Reliability Curves for n = 86. (s numbers on curves; for p_u, values are 1 less.)



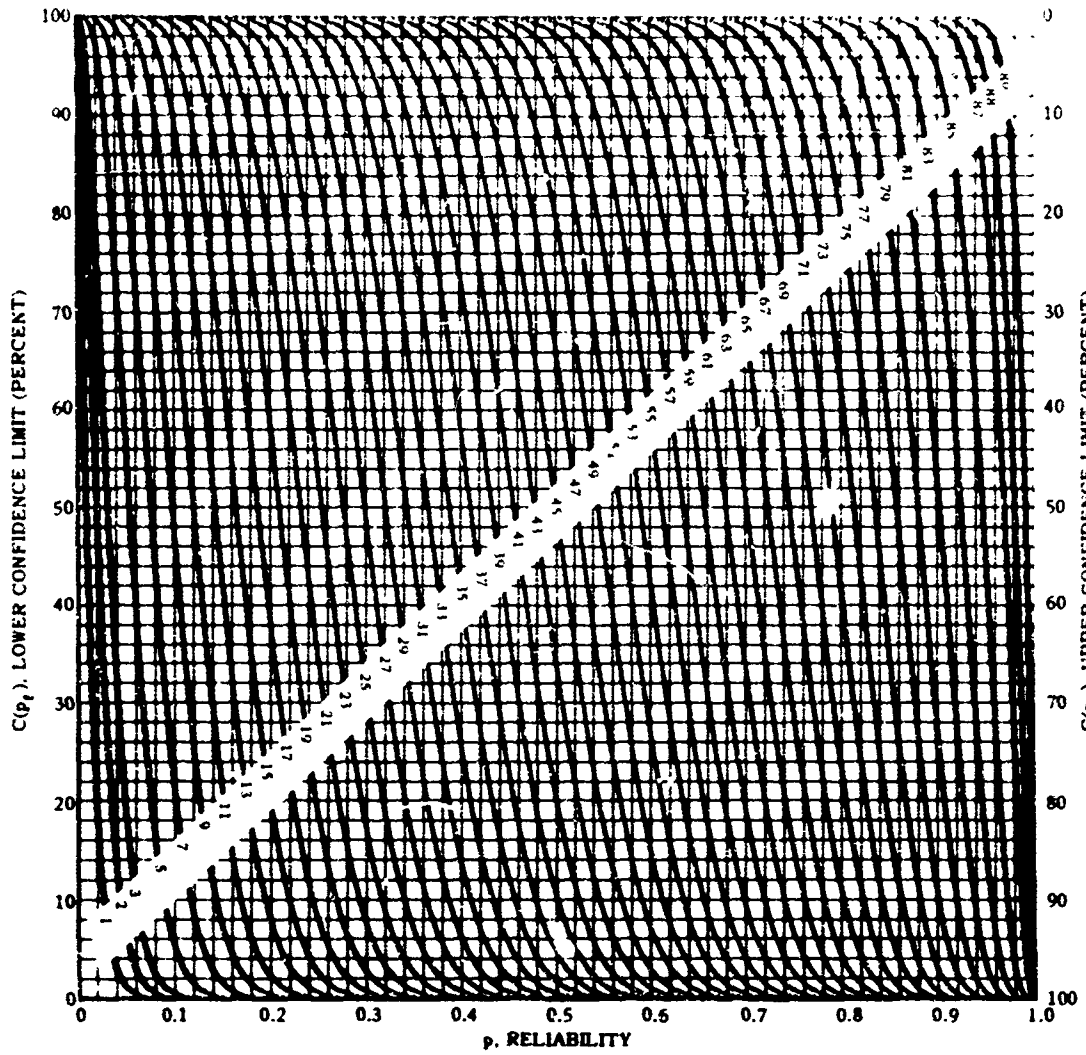
s, (s − 1) = 1,0; 2,1; 3,2, . . ., 87,86
(s + 1), s = 1,0; 2,1; 3,2; . . ., 87,86
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 87. Reliability Curves for n = 87. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2, ...; 88,87
(s + 1), s = 1 0; 2,1; 3,2; ..., 88,87
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 88. Reliability Curves for n = 88. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ...; 89,88

(s + 1), s = 1,0; 2,1; 3,2; ...; 89,88

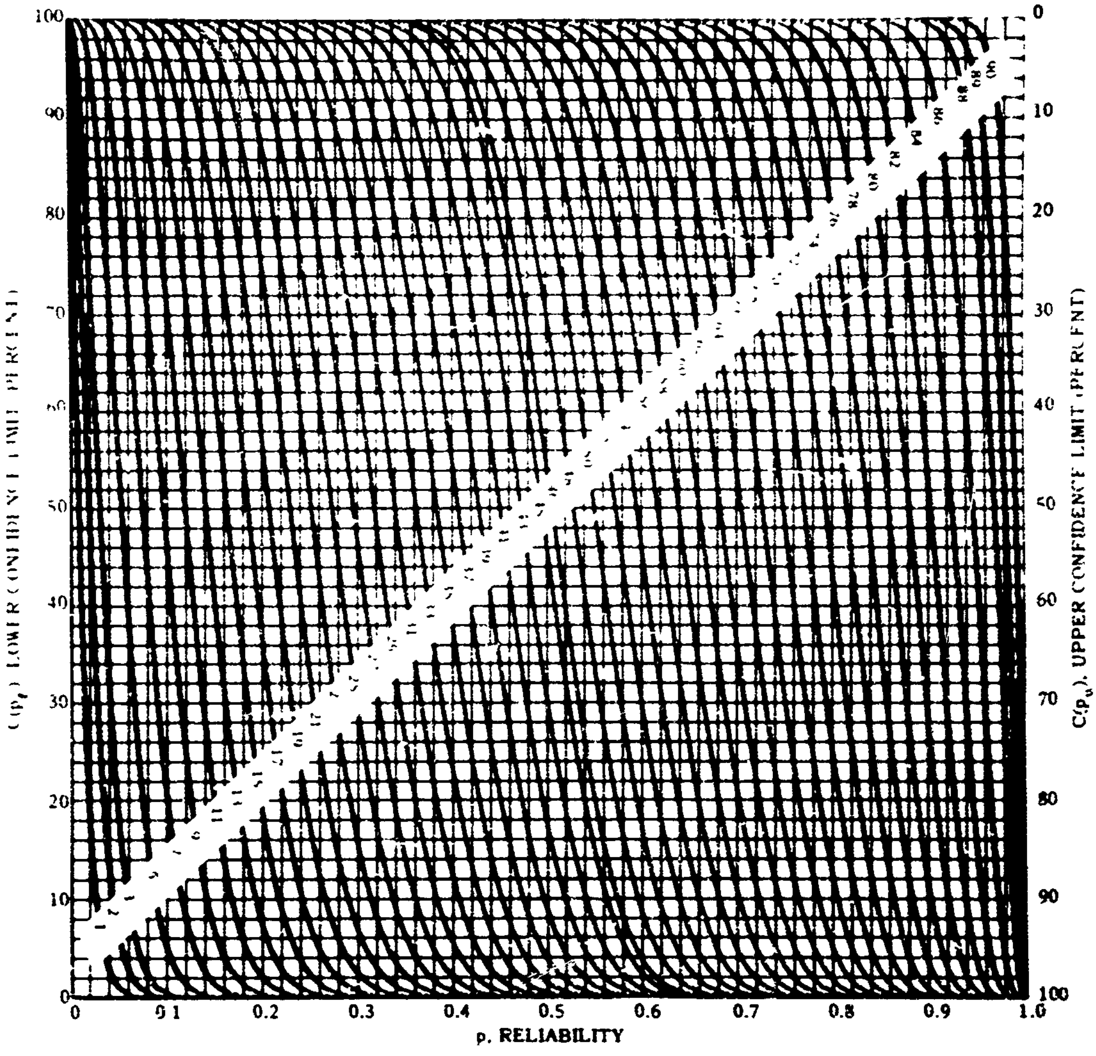
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)

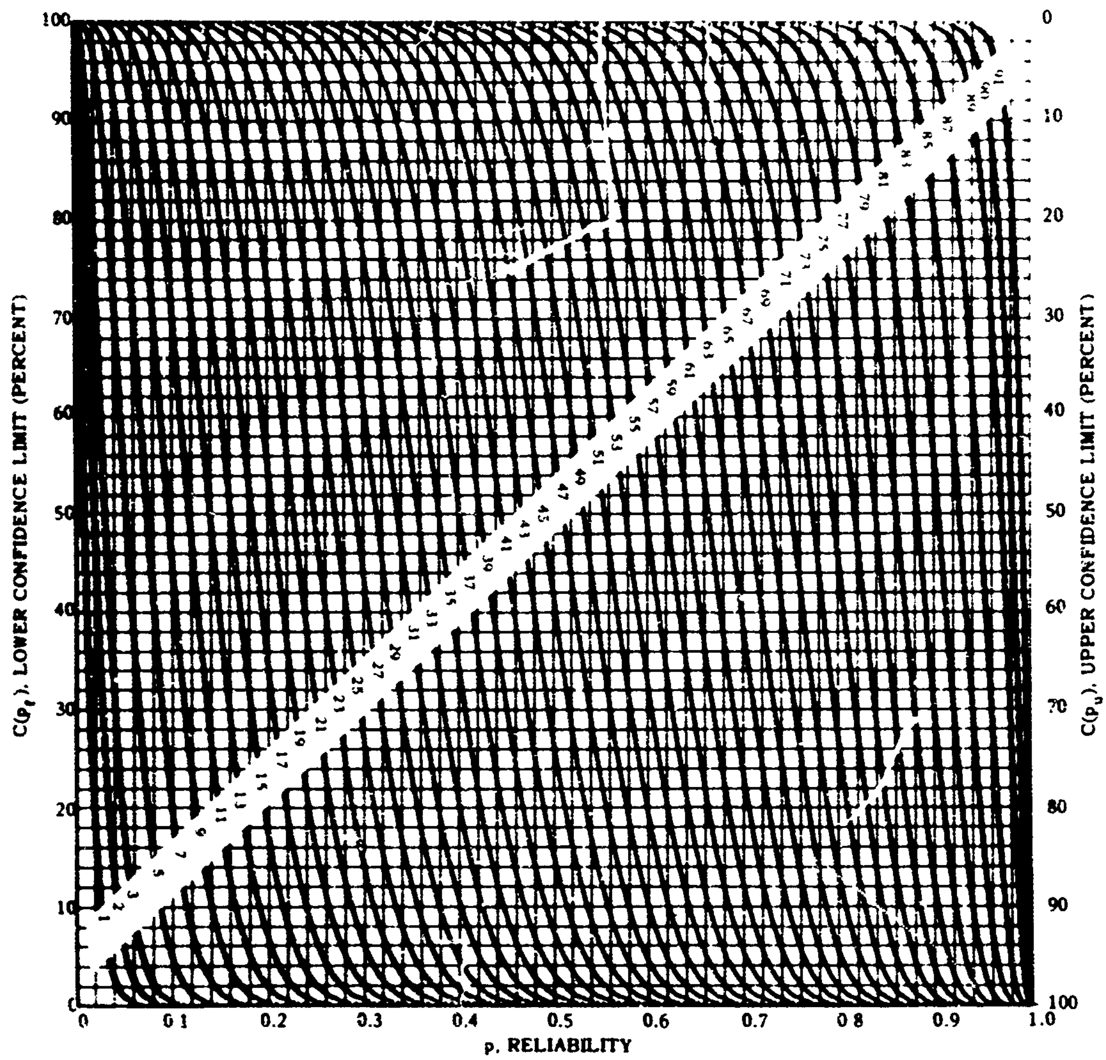
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 89. Reliability Curves for n = 89. (s numbers on curves; for p_u, values are 1 less.)



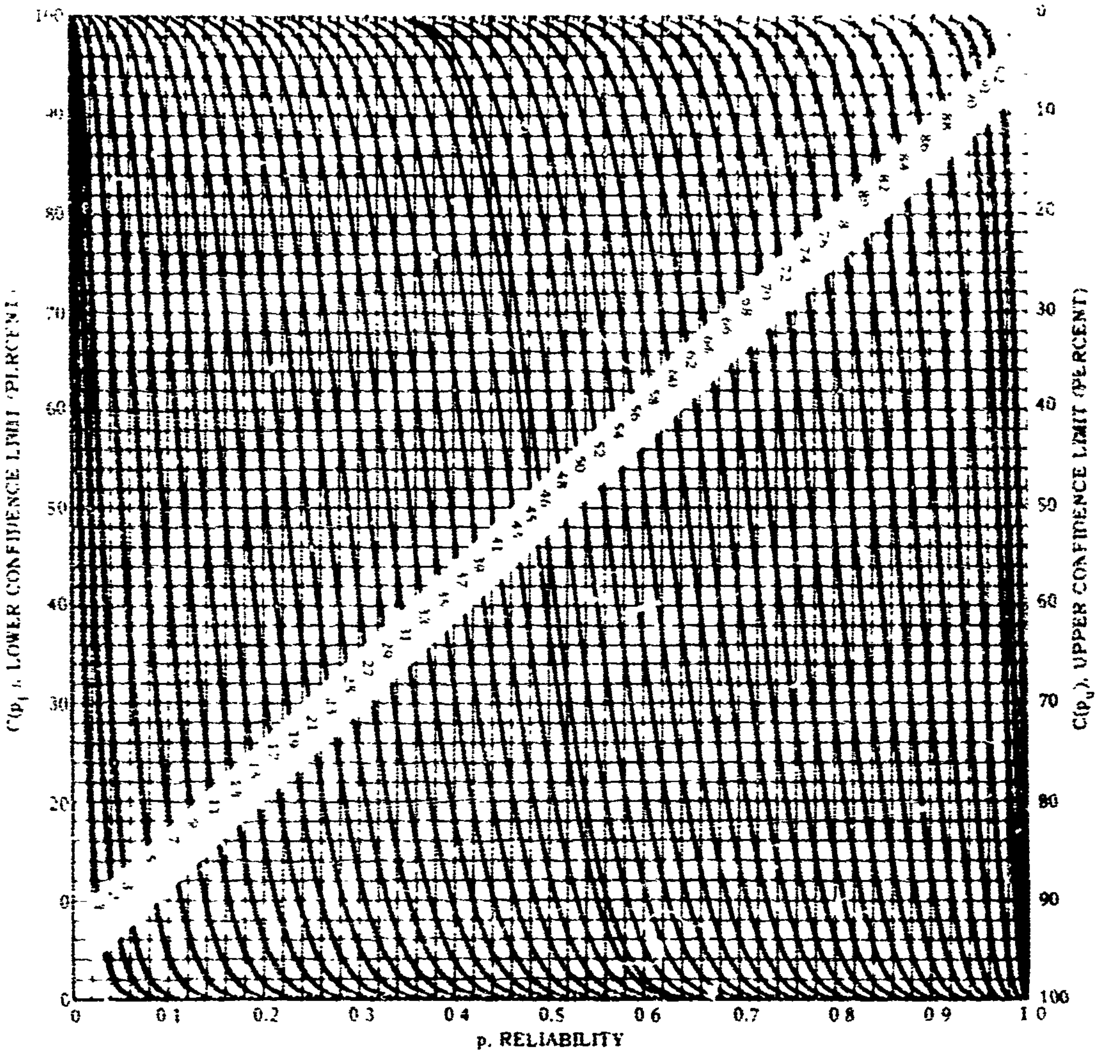
s, (s − 1) = 1,0; 2,1, 3,2; . . .; 90,89
(s + 1), s = 1,0; 2,1; 3,2; . . .; 90,89
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 90. Reliability Curves for n = 90. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1, 3,2, . . ; 91 90
(s + 1), s = 1 0; 2,1, 3,2, . . , 91 90
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 91. Reliability Curves for n = 91. (s numbers on curves; for p_u, values are 1 less.)



$s, (s-1) = 1,0; 2,1; 3,2, \ldots 92,91$

$(s+1), s = 1,0, 2,1; 3,2, \ldots, 92,91$

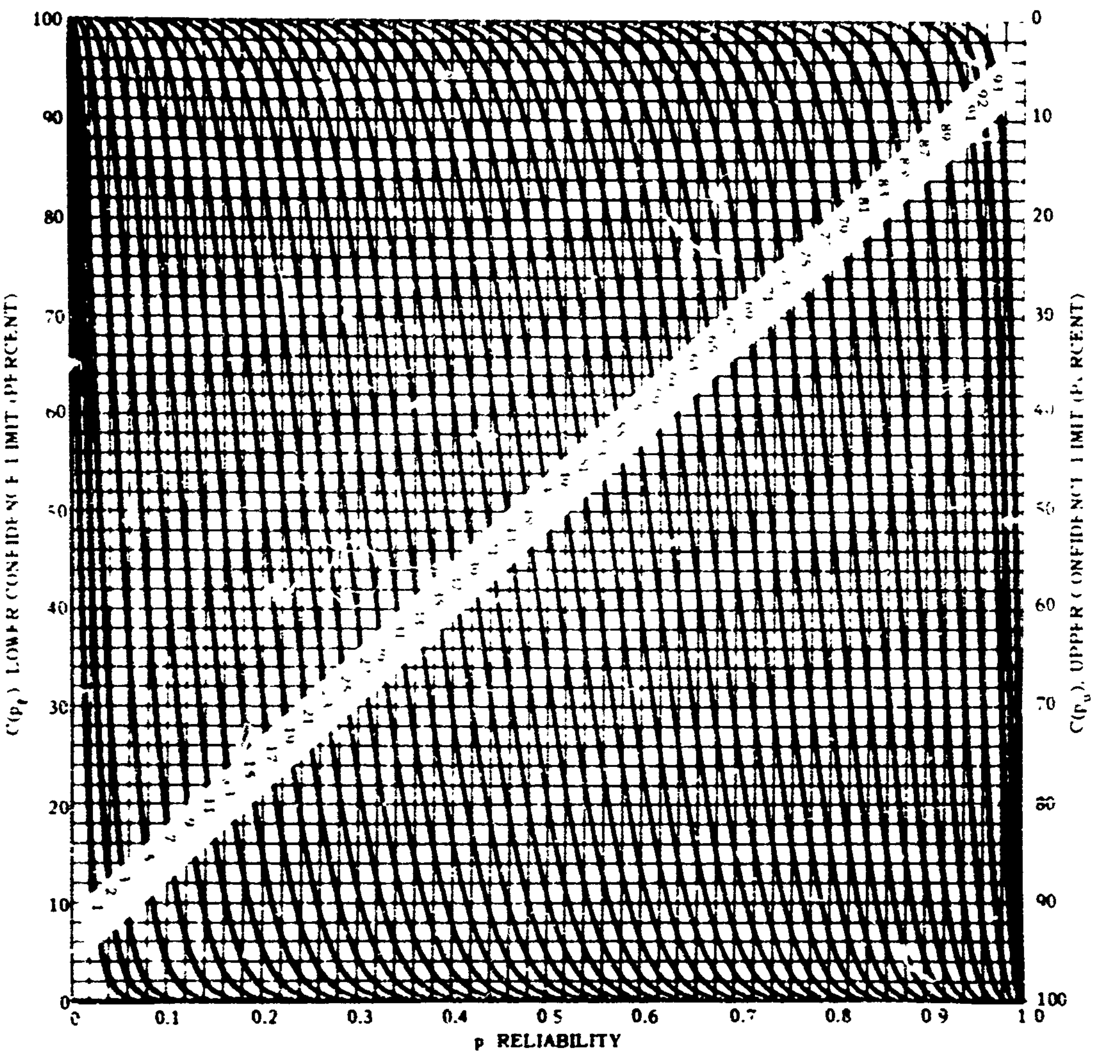
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)

RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 92. Reliability Curves for n = 92. (s numbers on curves; for p_u, values are 1 less.)



$s, (s - 1) = 1,0; 2,1, 3,2, \ldots 93\ 92$

$(s + 1), s = 1\ 0; 2,1, 3,2, \ldots 93\ 92$

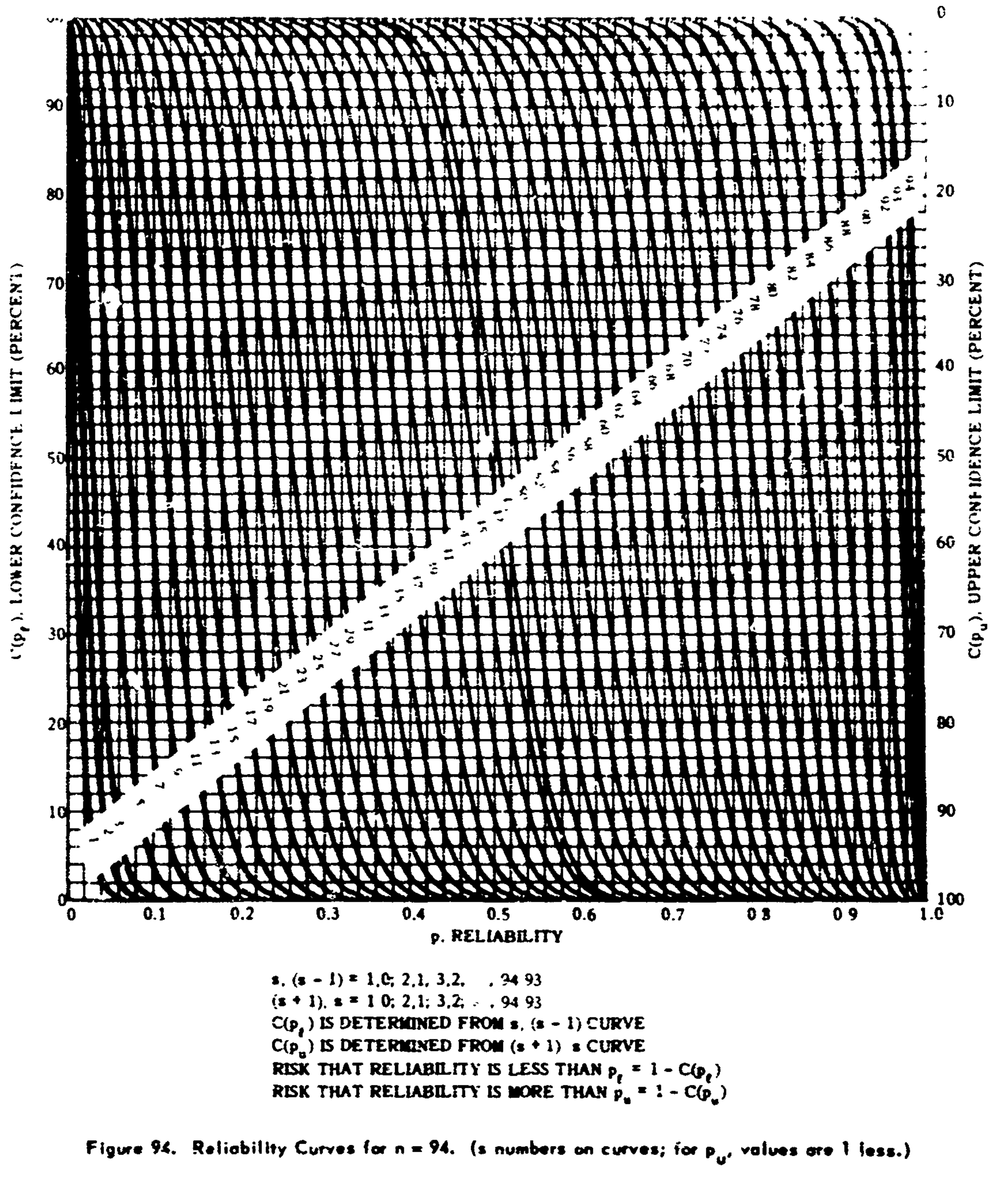
$C(p_\ell)$ IS DETERMINED FROM $s, (s - 1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s + 1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

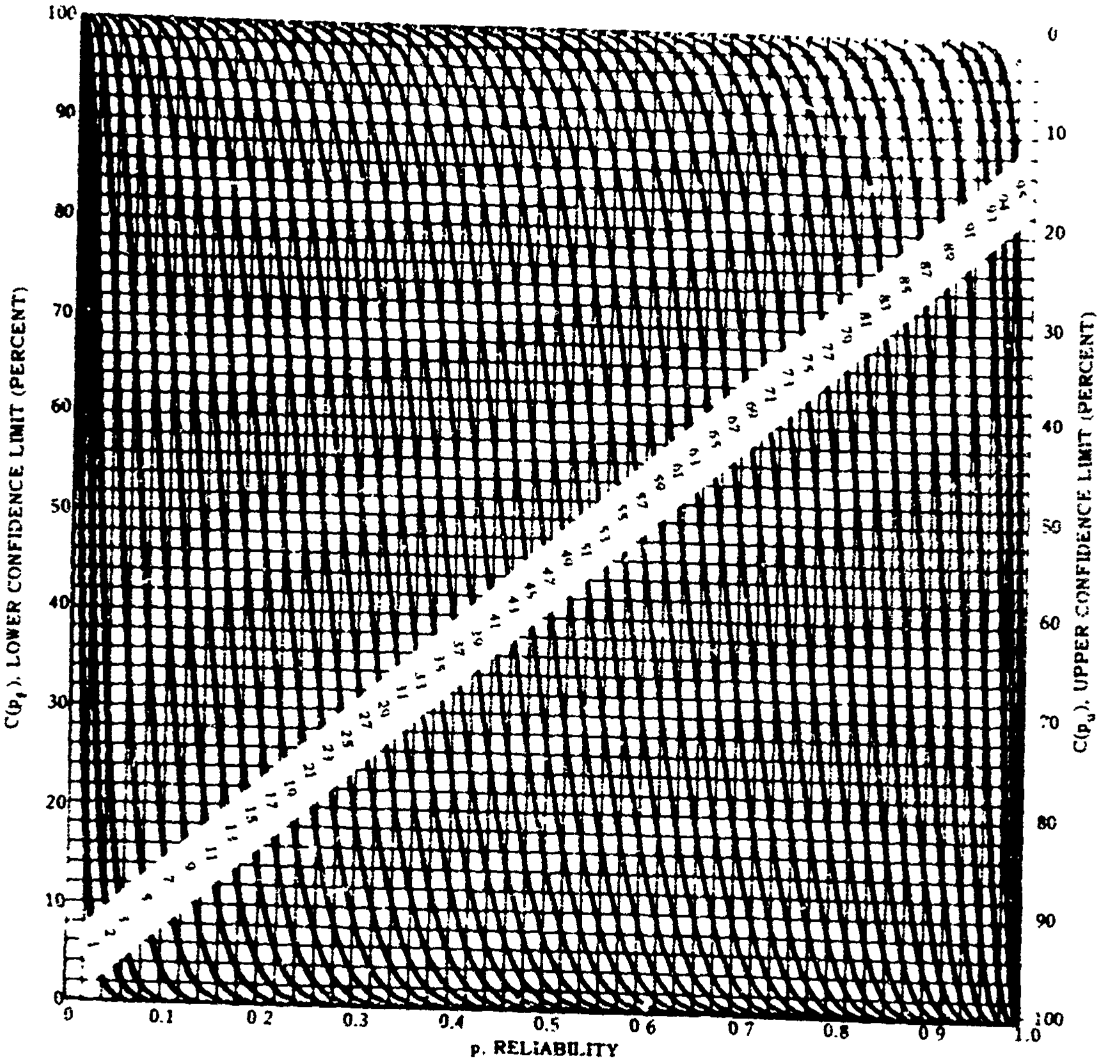
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 73. Reliability Curves for n = 93. (s numbers on curves; for p_u, values are 1 less)



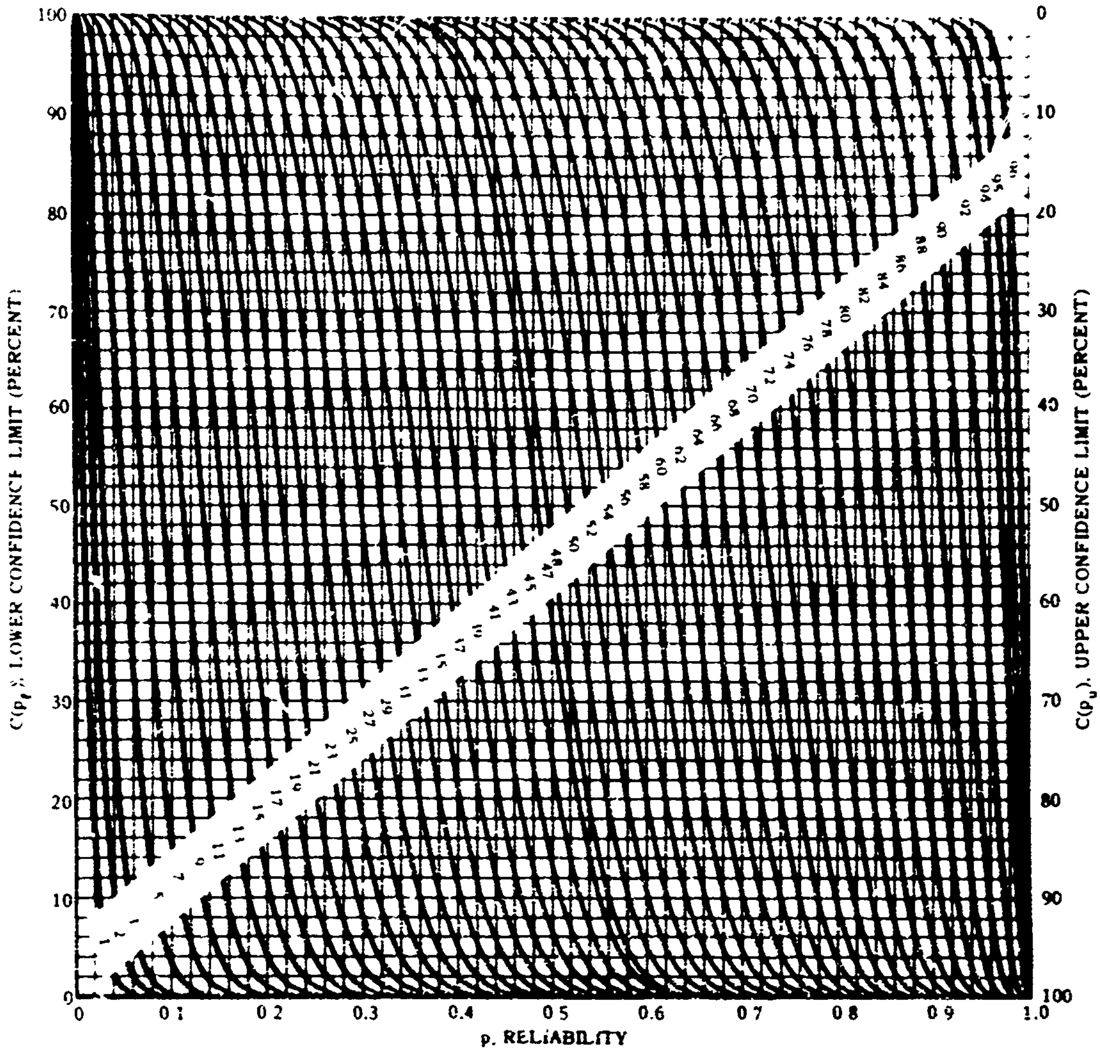
s, (s - 1) = 1,0; 2,1; 3,2; . . . , 94 93
(s + 1), s = 1 0; 2,1; 3,2; . . . , 94 93
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 94. Reliability Curves for n = 94. (s numbers on curves; for p_u, values are 1 less.)



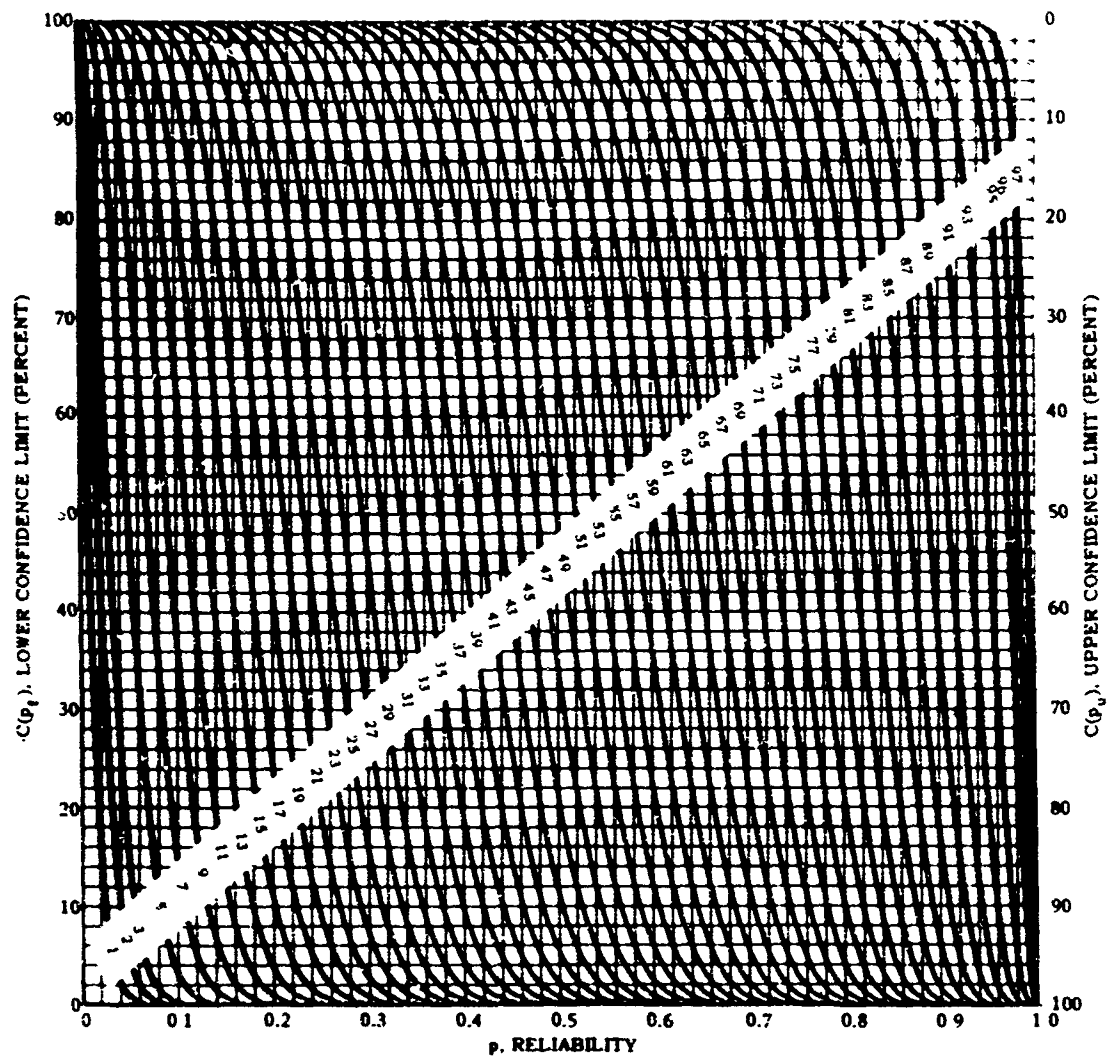
$s, (s-1) = 1,0; 2,1; 3,2, \ldots, 95,94$
$(s+1), s = 1,0; 2,1; 3,2, \ldots; 95,94$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 95. Reliability Curves for $n = 95$. (s numbers on curves; for p_u, values are 1 less.)



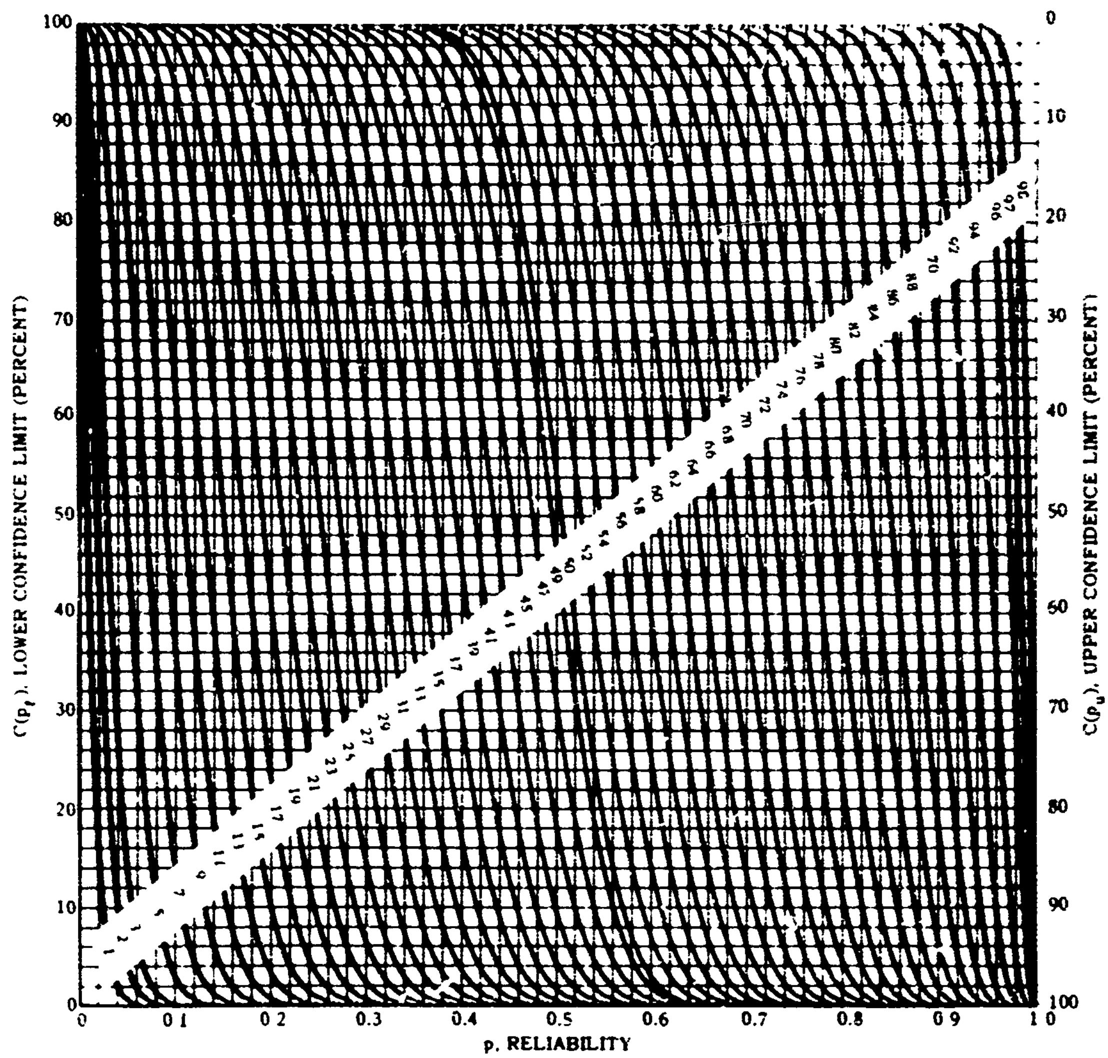
s, (s − 1) = 1,0; 2,1; 3,2; . . . 96,95
(s + 1), s = 1,0; 2,1; 3,2; . . . 96,95
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = $1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = $1 - C(p_u)$

Figure 96. Reliability Curves for n = 96. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2; ... ; 97,96
(s + 1), s = 1,0; 2,1; 3,2; ... ; 97,96
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 97. Reliability Curves for n = 97. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ... 98,97
(s + 1), s = 1,0; 2,1; 3,2; ... 98,97
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 98. Reliability Curves for n = 98. (s numbers on curves; for p_u, values are 1 less.)

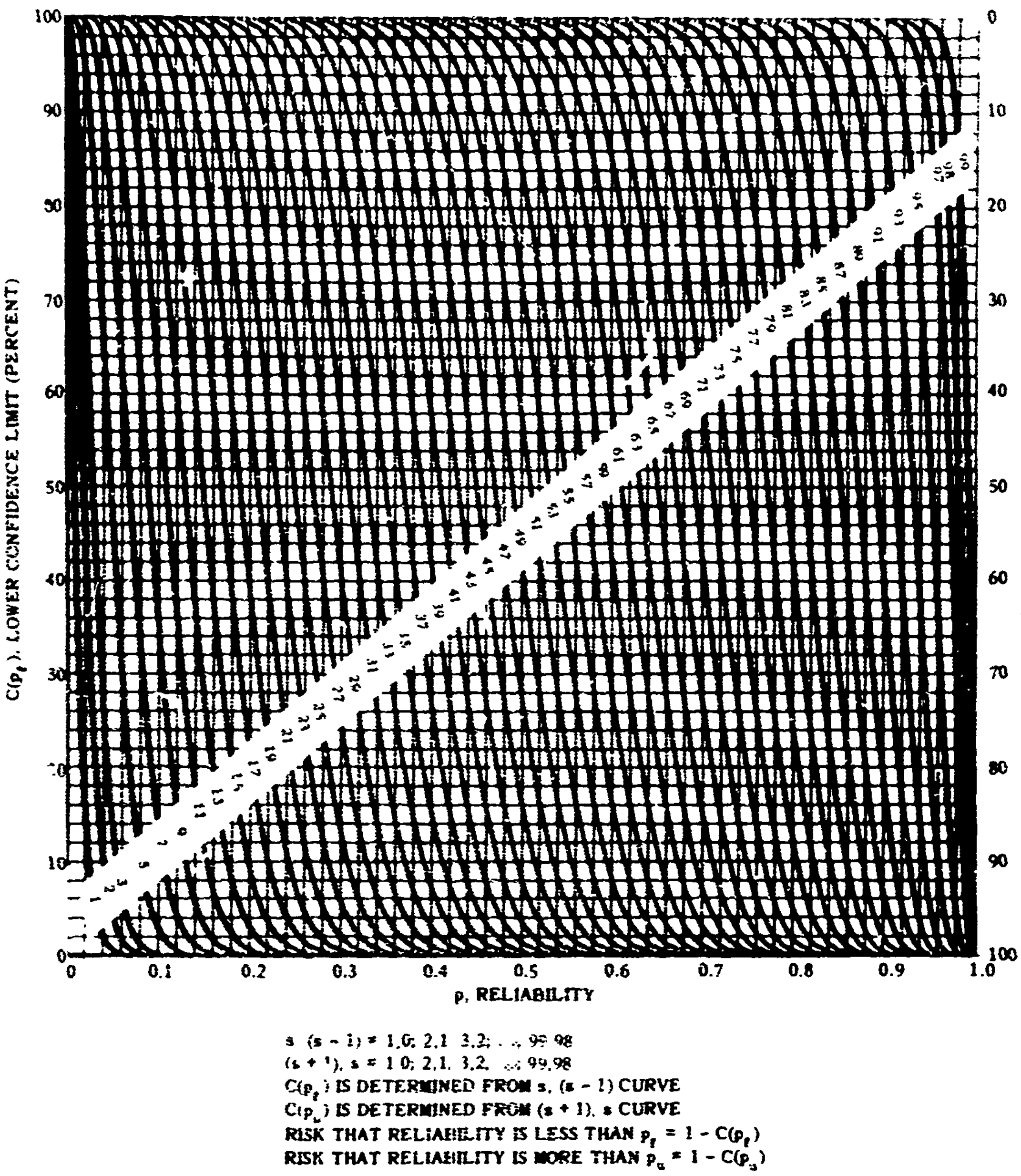
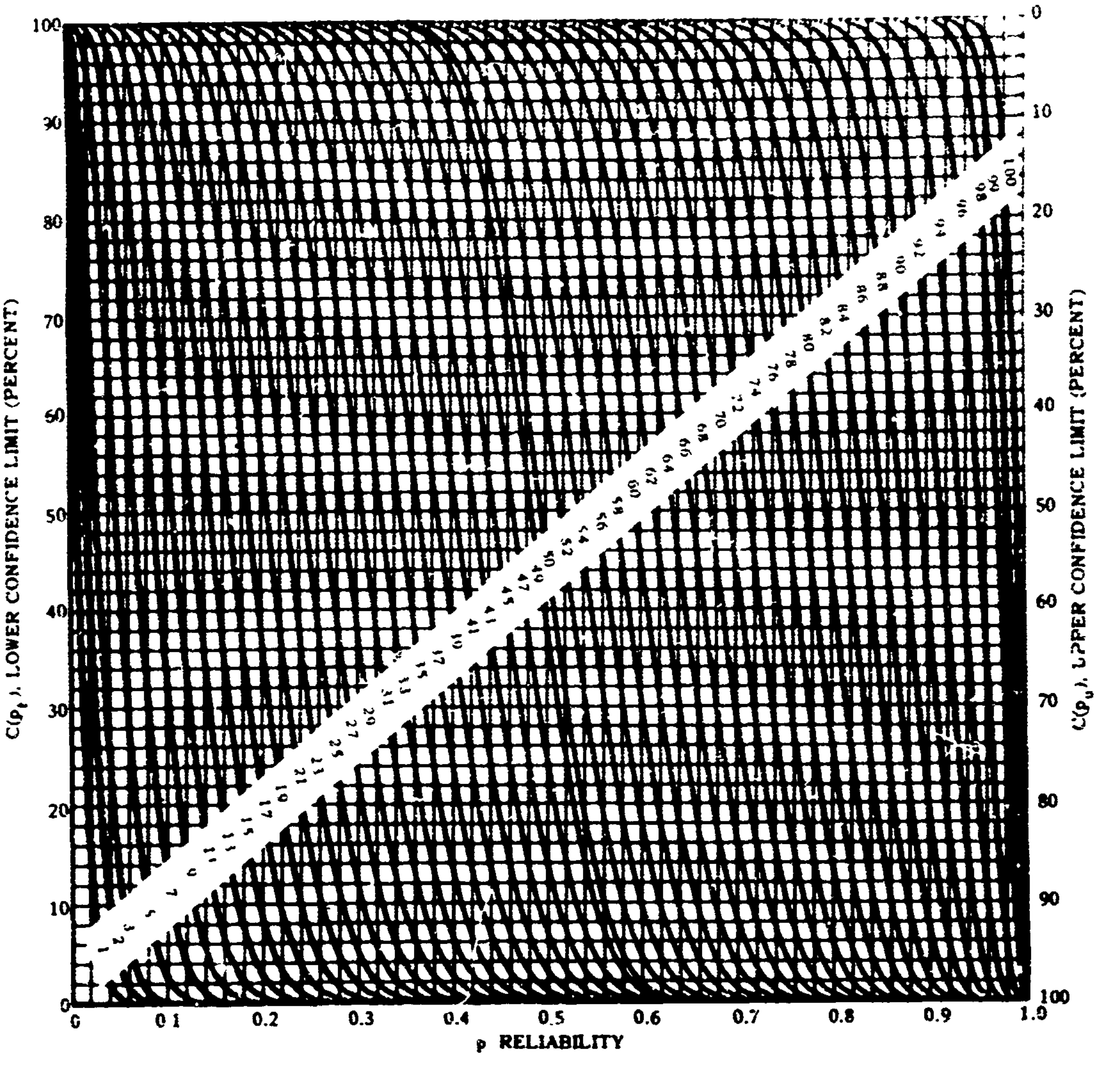
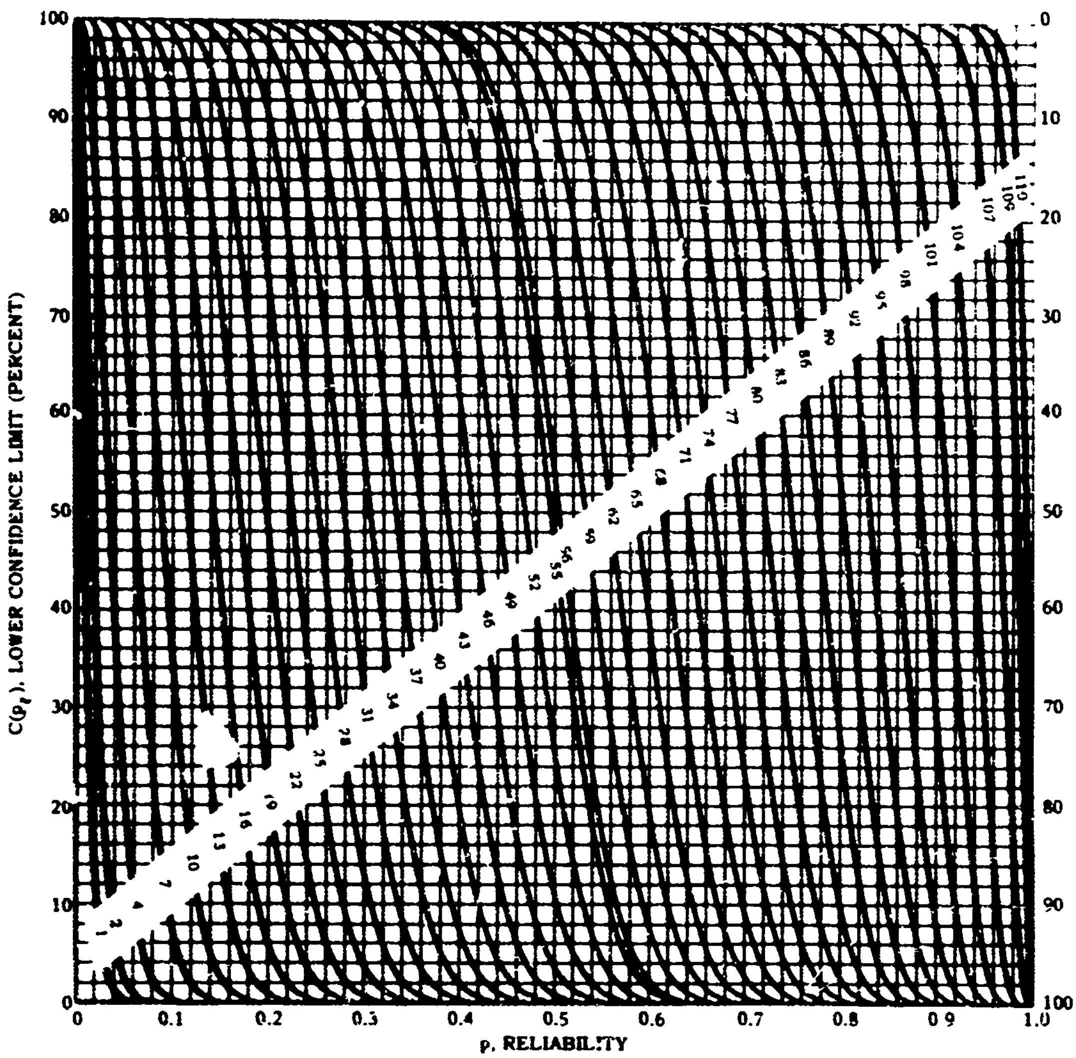


Figure 99. Reliability Curves for n = 99. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1, 3,2; .., 100.99
(s + 1), s = 1 0; 2,1, 3 2, . .; 100.99
C(p_l) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_l = 1 - C(p_l)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 100. Reliability Curves for n = 100. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1, 3,2; . . .; 110,109

(s + 1), s = 1,0; 2,1, 3,2; . . . 110,109

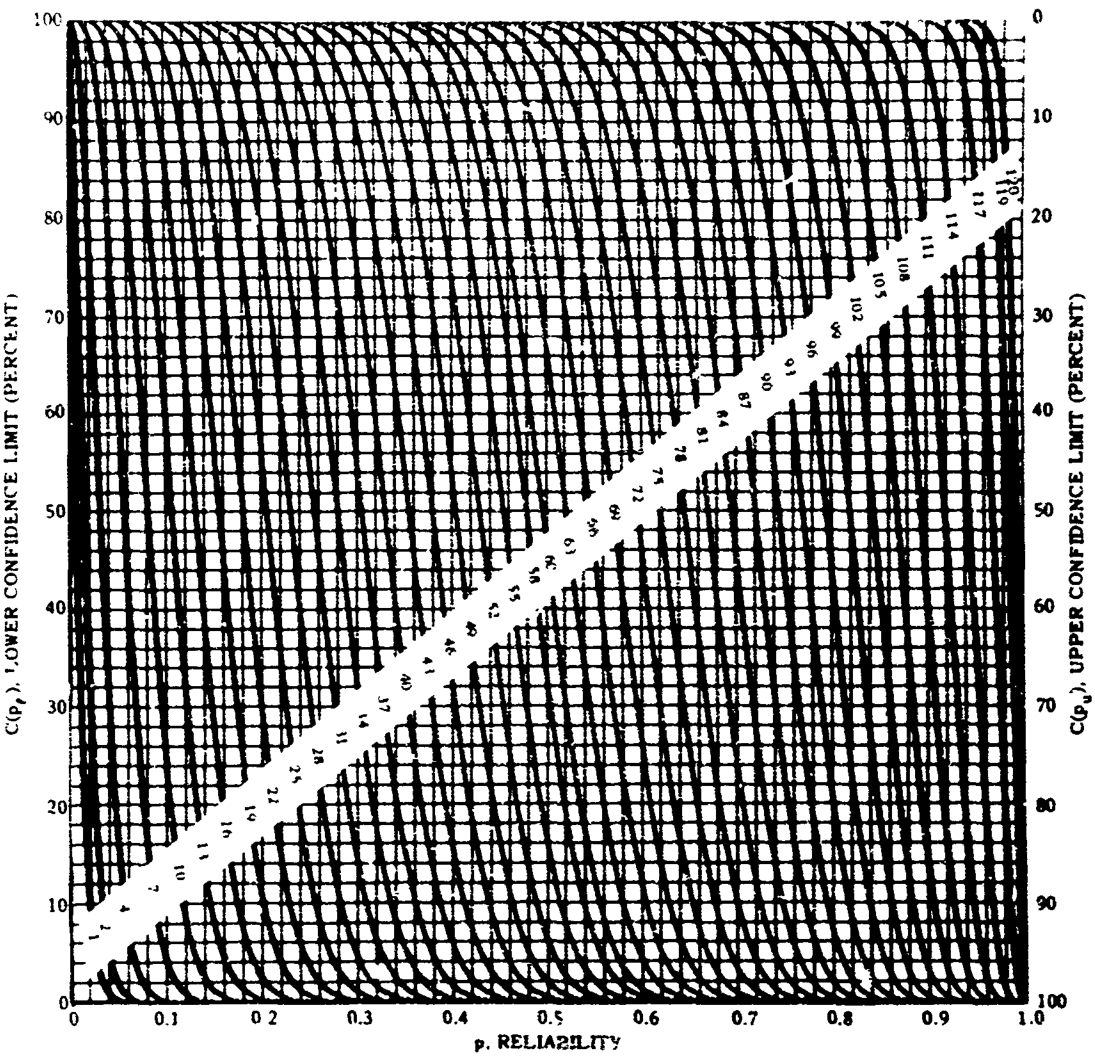
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)

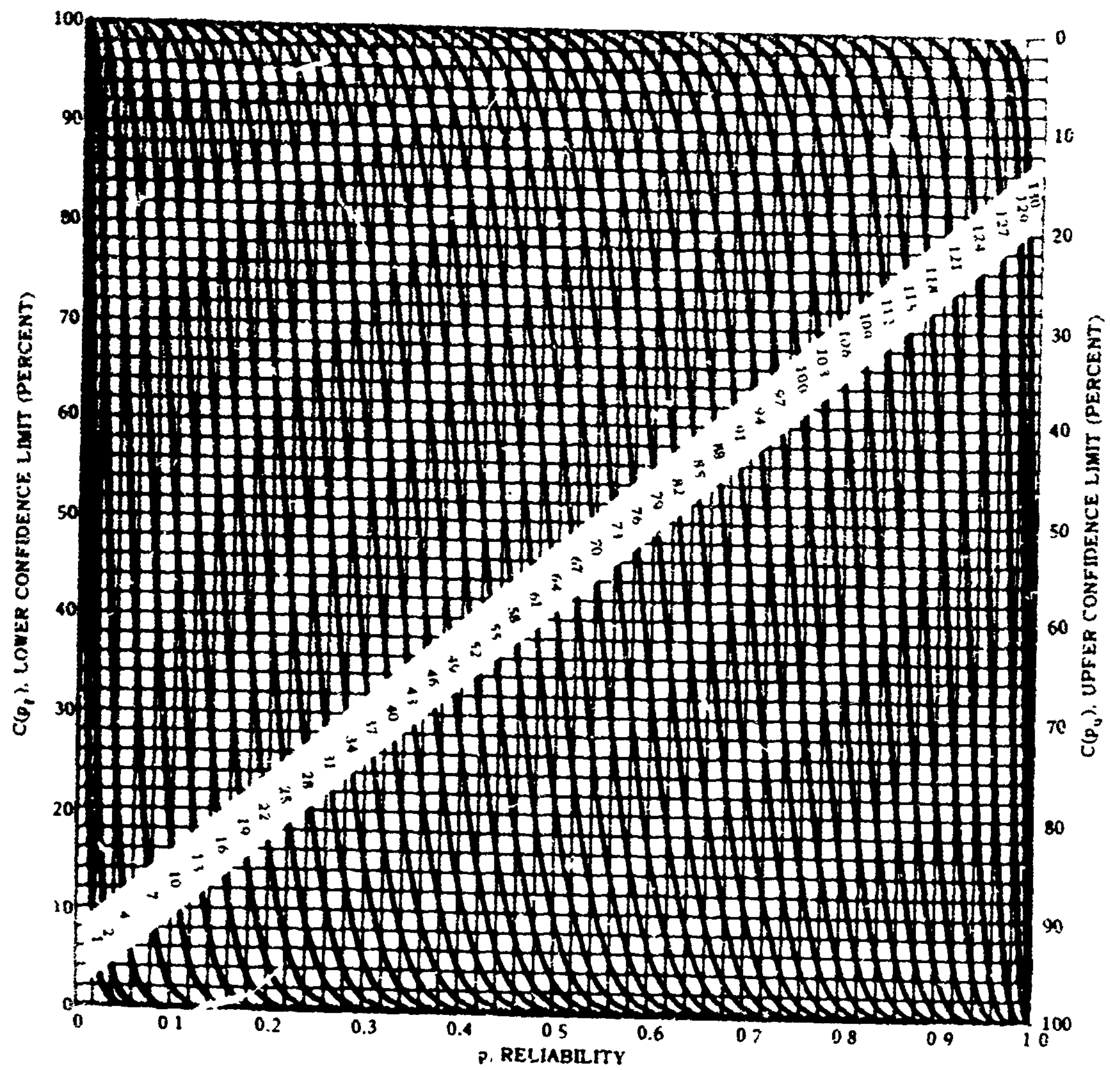
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 101. Reliability Curves for n = 110. (s numbers on curves; for p_u, values are 1 less.)



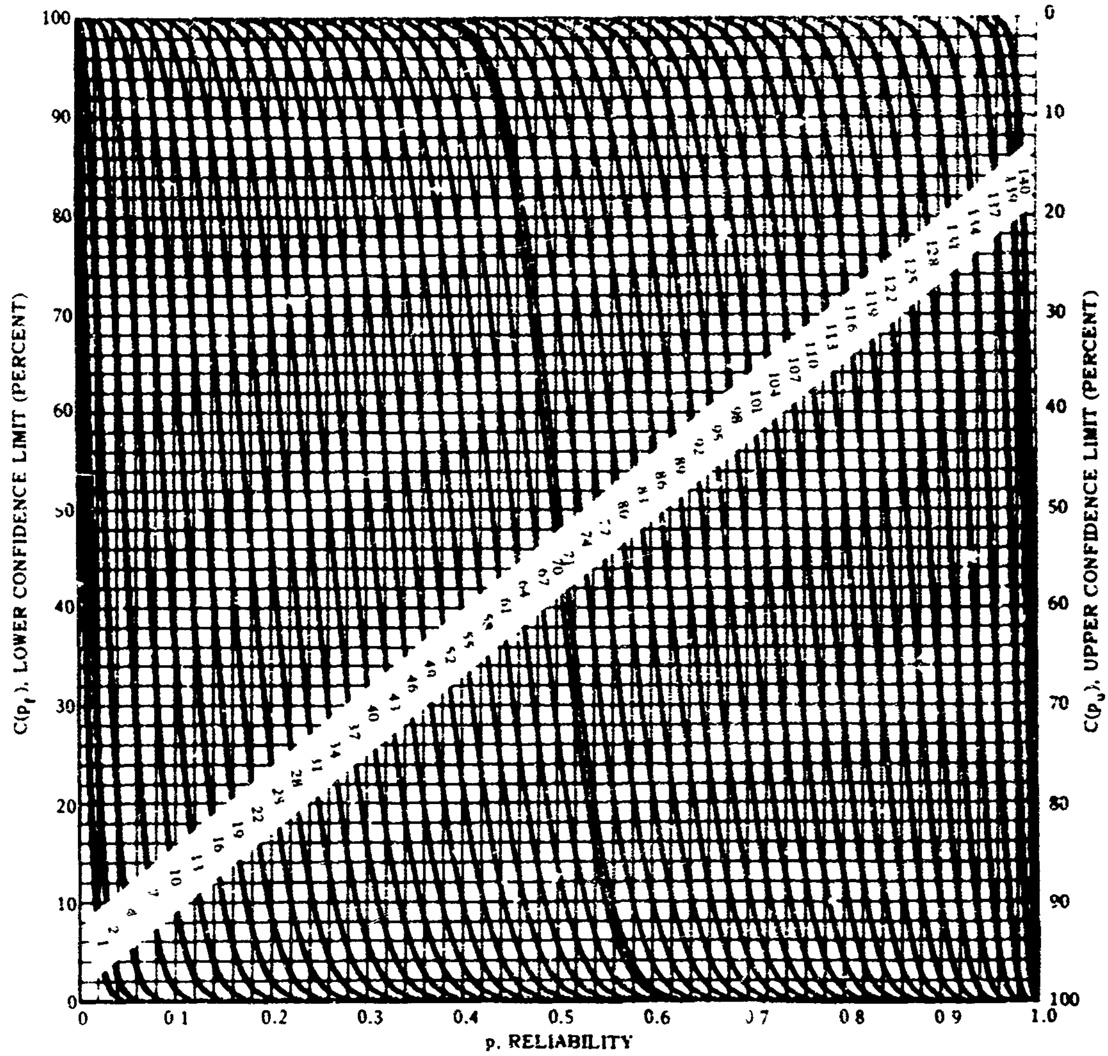
s, (s − 1) = 1,0; 2,1; 3,2, ...; 120,119
(s + 1), s = 1 0; 2,1, 3,2, ... ; 120,119
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 102. Reliability Curves for n = 120. (s numbers on curves; for p_u, values are 1 less.)



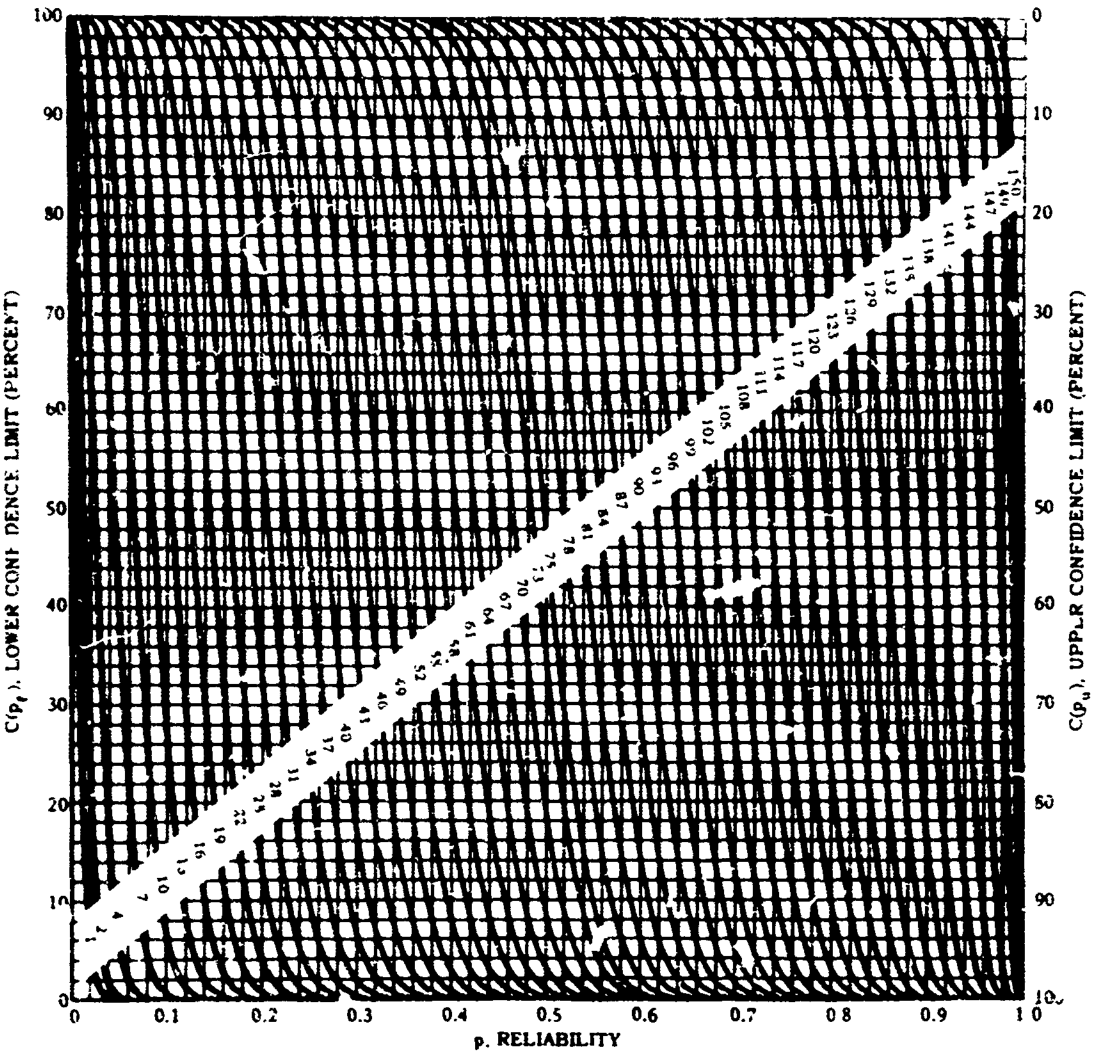
s, (s − 1) = 1,0; 2,1; 3,2, ... 130 129
(s + 1), s = 1 0, 2 1; 3,2, ... 130 129
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 103. Reliability Curves for n = 130. (s numbers on curves; for p_u, values are 1 less.)



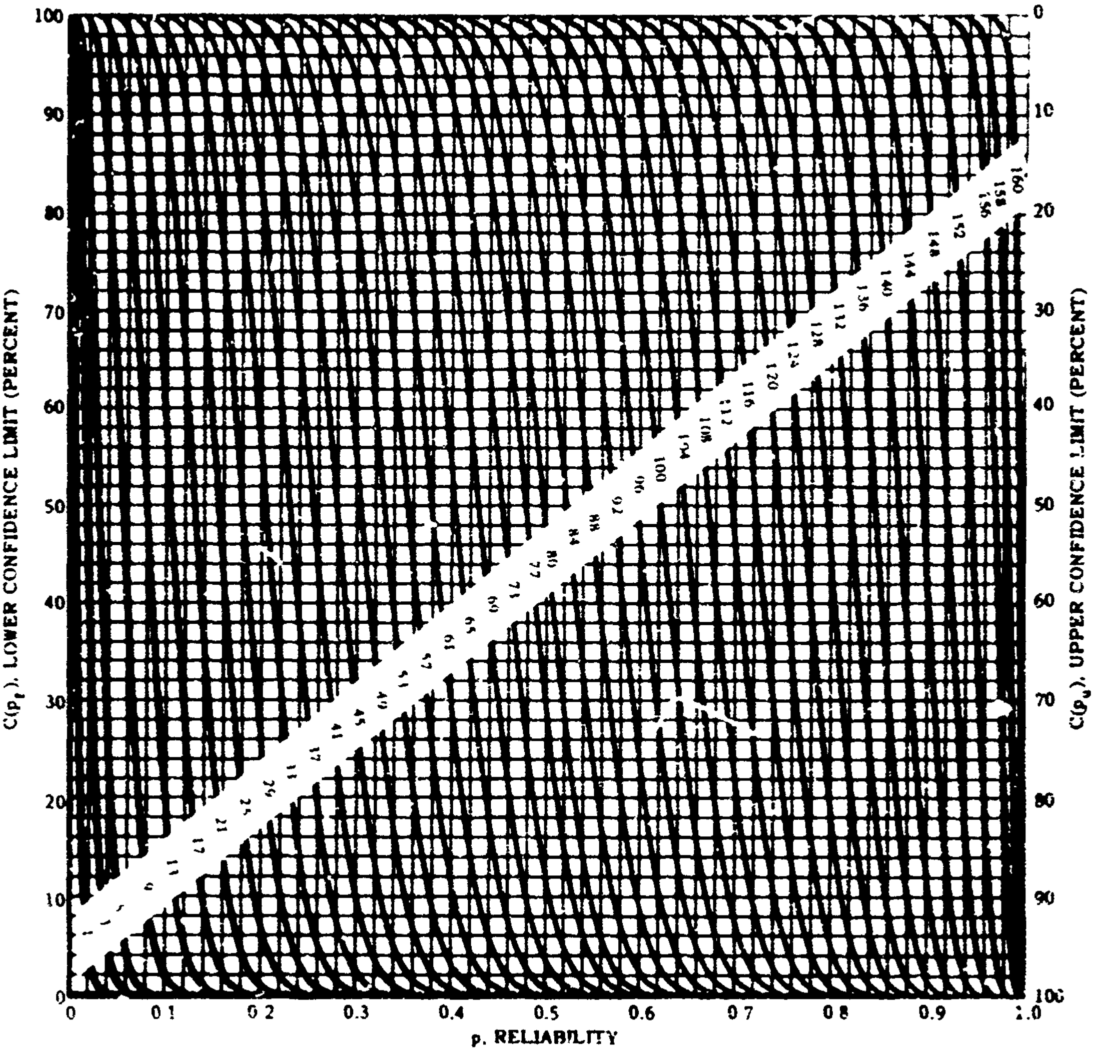
s, (s − 1) = 1,0; 2,1; 3,2, ..., 140,139
(s + 1), s = 1 0; 2,1; 3,2, ..., 140,139
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 104. Reliability Curves for n = 140. (s numbers on curves; for p_u, values are 1 less.)



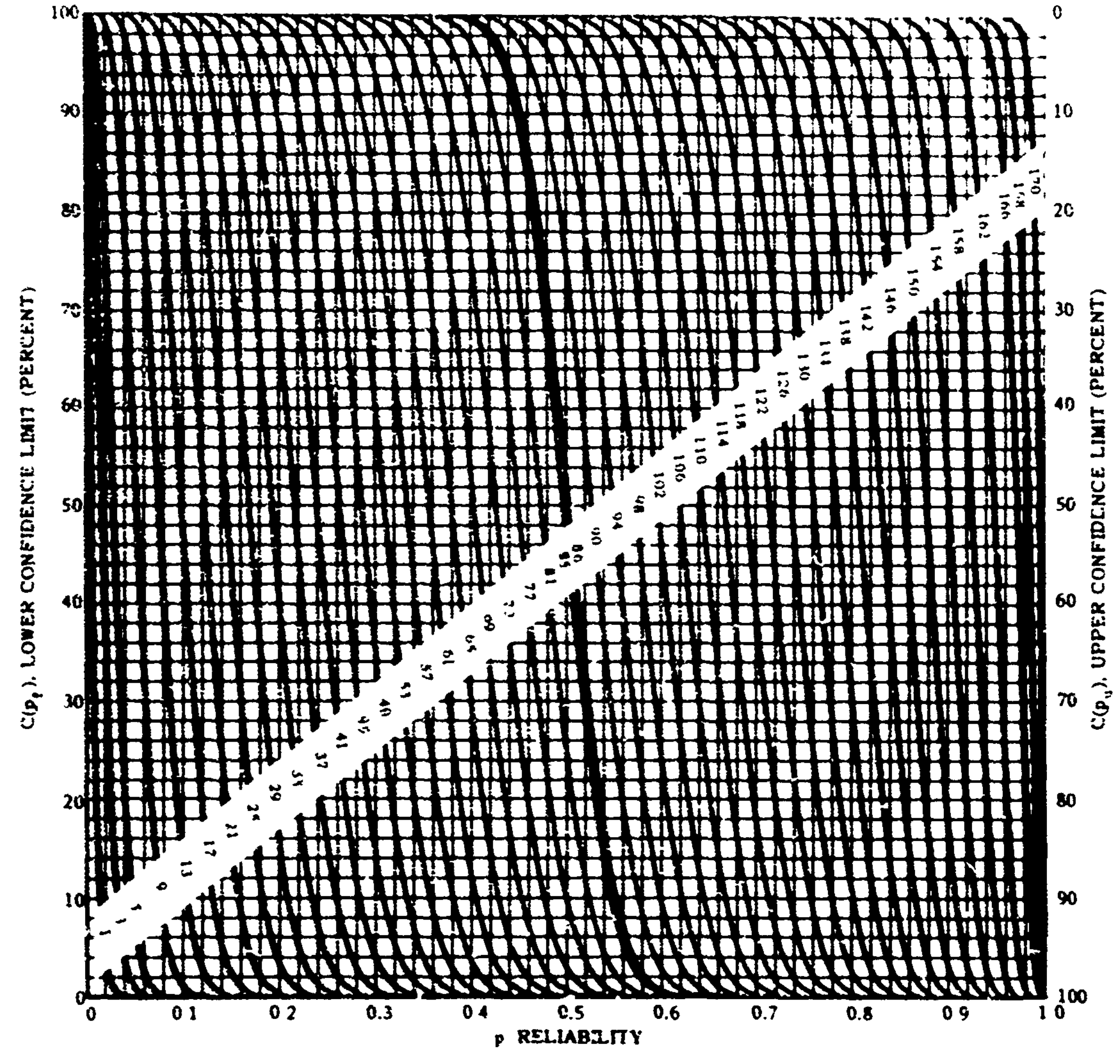
s, (s - 1) = 1 0; 2,1, 3,2; .., 150,149
(s + 1) s = 1 0; 2,1, 3,2, ..; 150,149
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 105. Reliability Curves for n = 150. (s numbers on curves; for p_u, values are 1 less.)



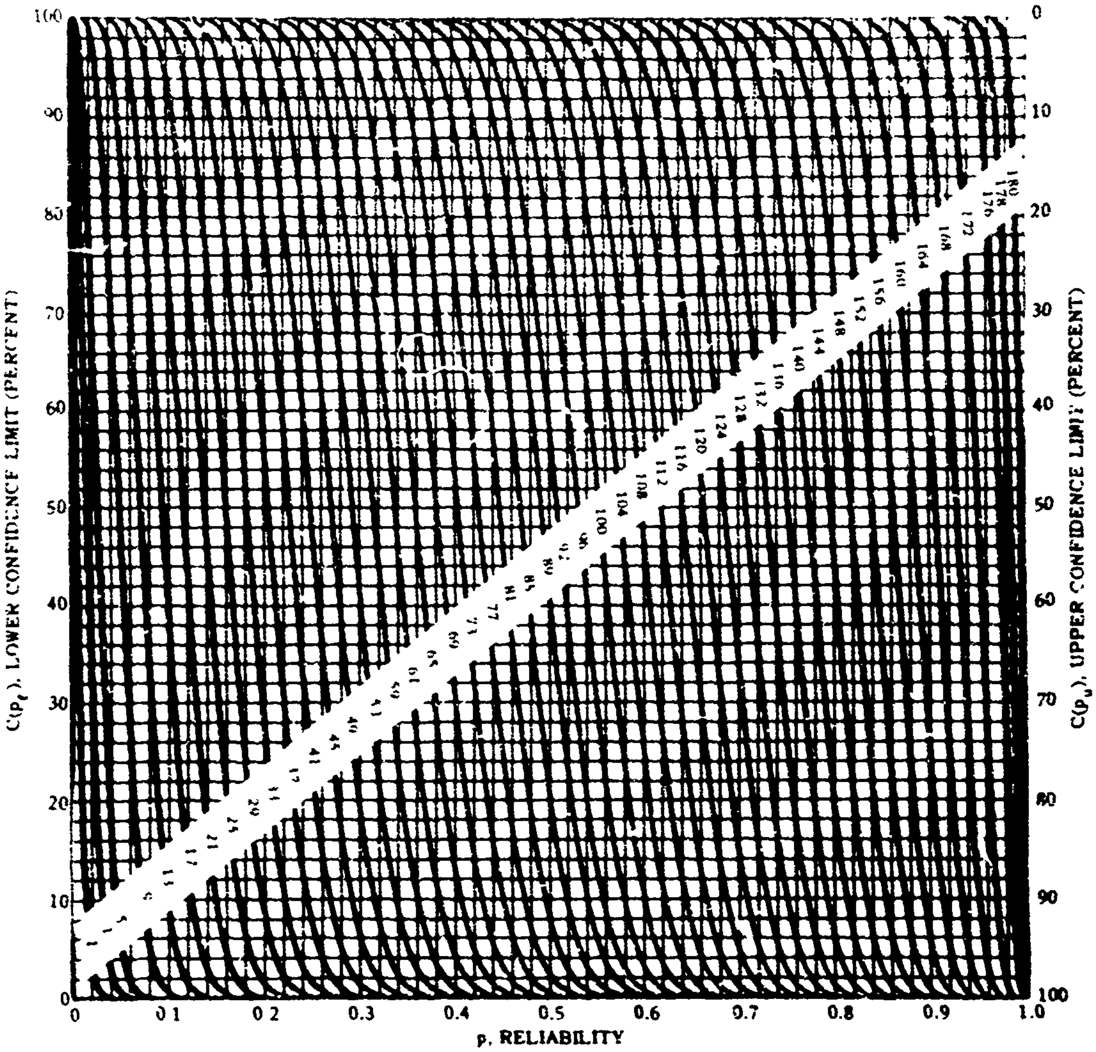
$s, (s - 1) = 1, 0; 2,1; 3,2; \ldots, 160, 159$
$(s + 1), s = 1, 0; 2,1; 3,2; \ldots, 160, 159$
$C(p_\ell)$ IS DETERMINED FROM $s, (s - 1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s + 1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 106 Reliability Curves for $n = 160$ (s numbers on curves; for p_u, values are 1 less.)



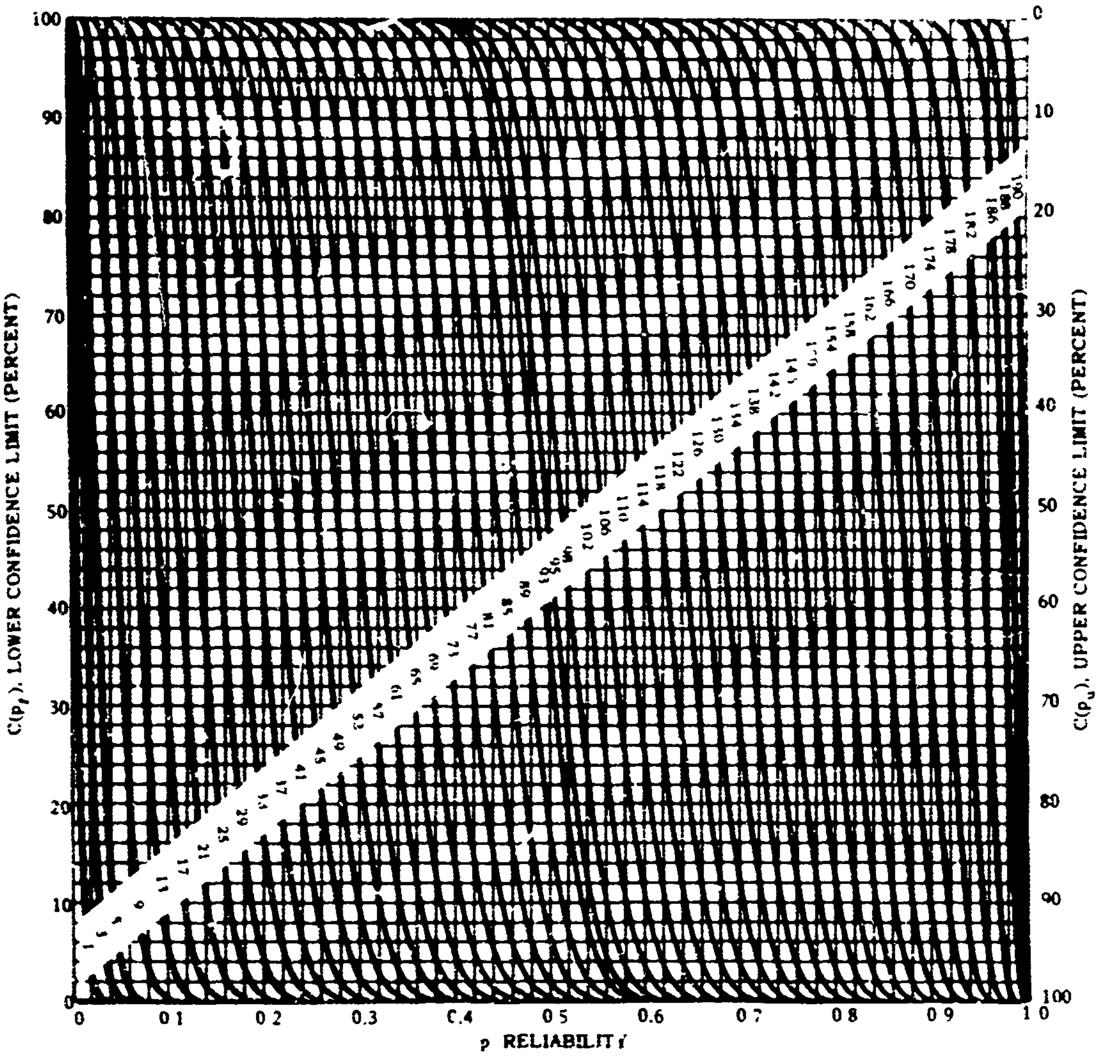
s, (s − 1) = 1 0; 2,1; 3,2, ... ; 170,169
(s + 1), s = 1 0, 2,1; 3,2, ... ; 170,169
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 107. Reliability Curves for n = 170. (s numbers on curves; for p_u, values are 1 less.)



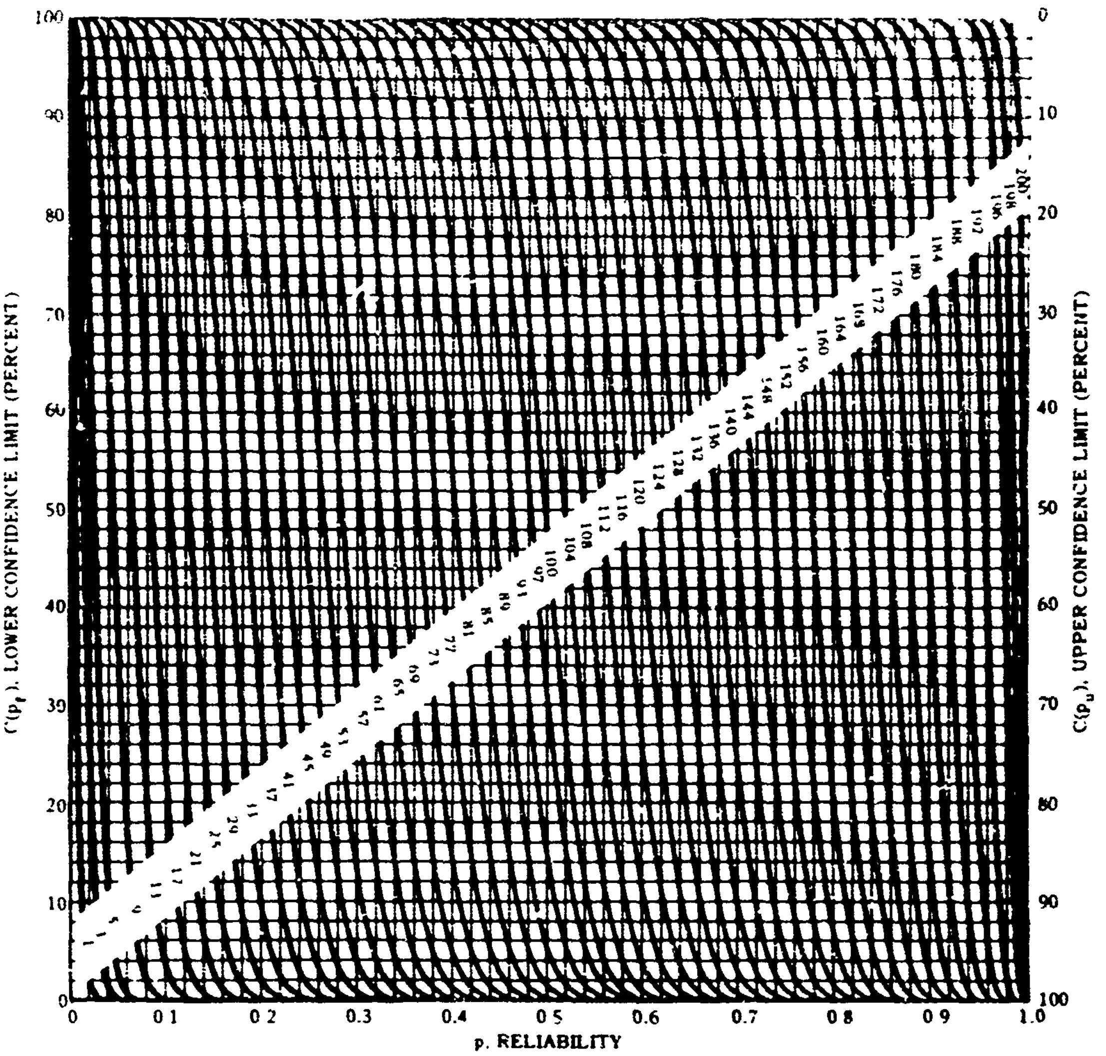
$s, (s-1) = 1,0; 2,1, 3,2, \ldots, 180\ 179$
$(s+1), s = 1\ 0; 2,1; 3,2, \ldots, 180\ 179$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 108. Reliability Curves for n = 180. (s numbers on curves; for p_u, values are 1 less.)



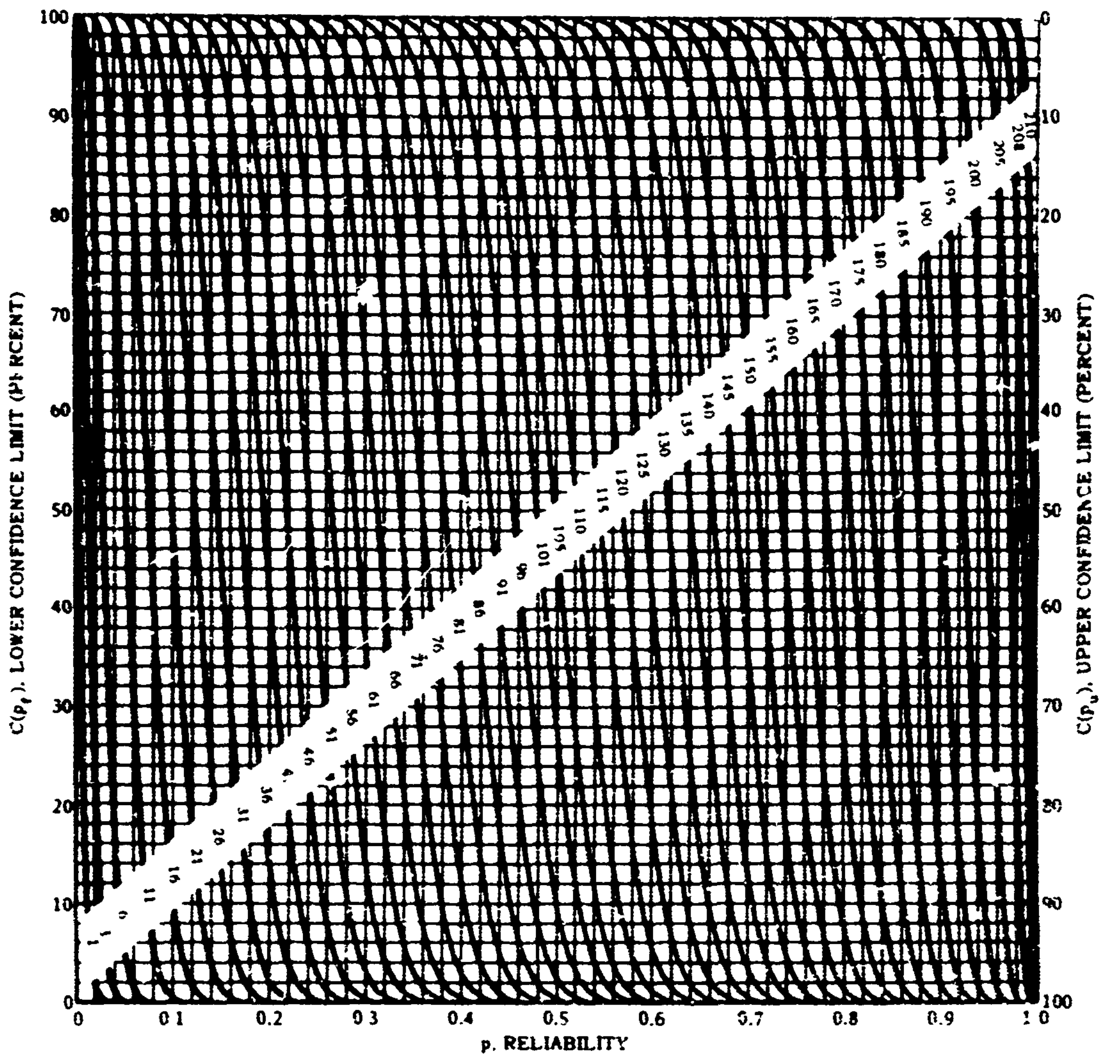
s, (s - 1) = 1,0; 2,1, 3,2, . . . 190 189
(s + 1) s = 1 0, 2,1, 3 2, . . . 190 189
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 109. Reliability Curves for n = 190. (s numbers on curves; for p_u, values are 1 less.)



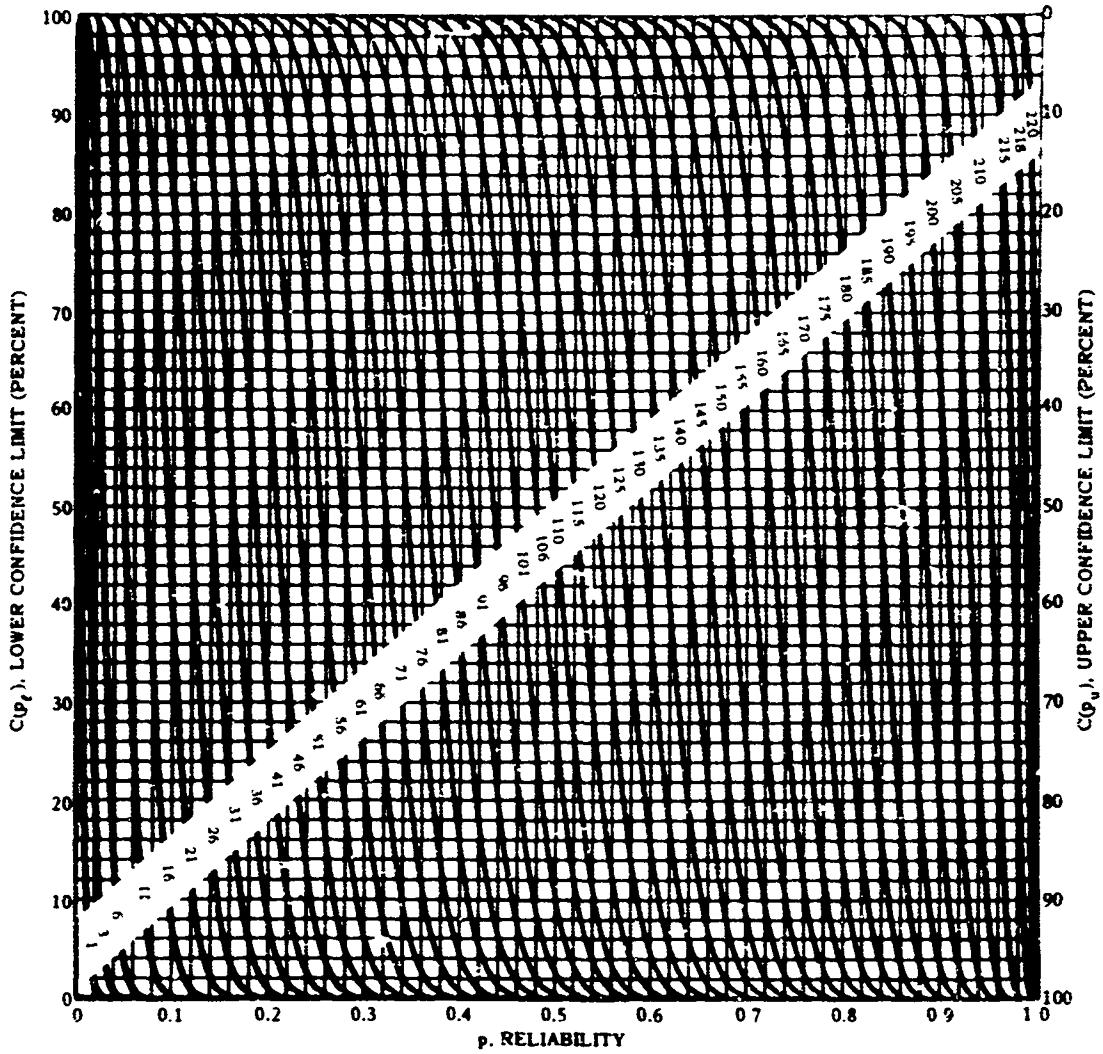
s (s − 1) = 1,0; 2,1; 3,2, . . . , 200 199
(s + 1) s = 1 0, 2,1, 3,2, . . . , 200 199
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 110. Reliability Curves for n = 200. (s numbers on curves; for p_u, values are 1 less.)



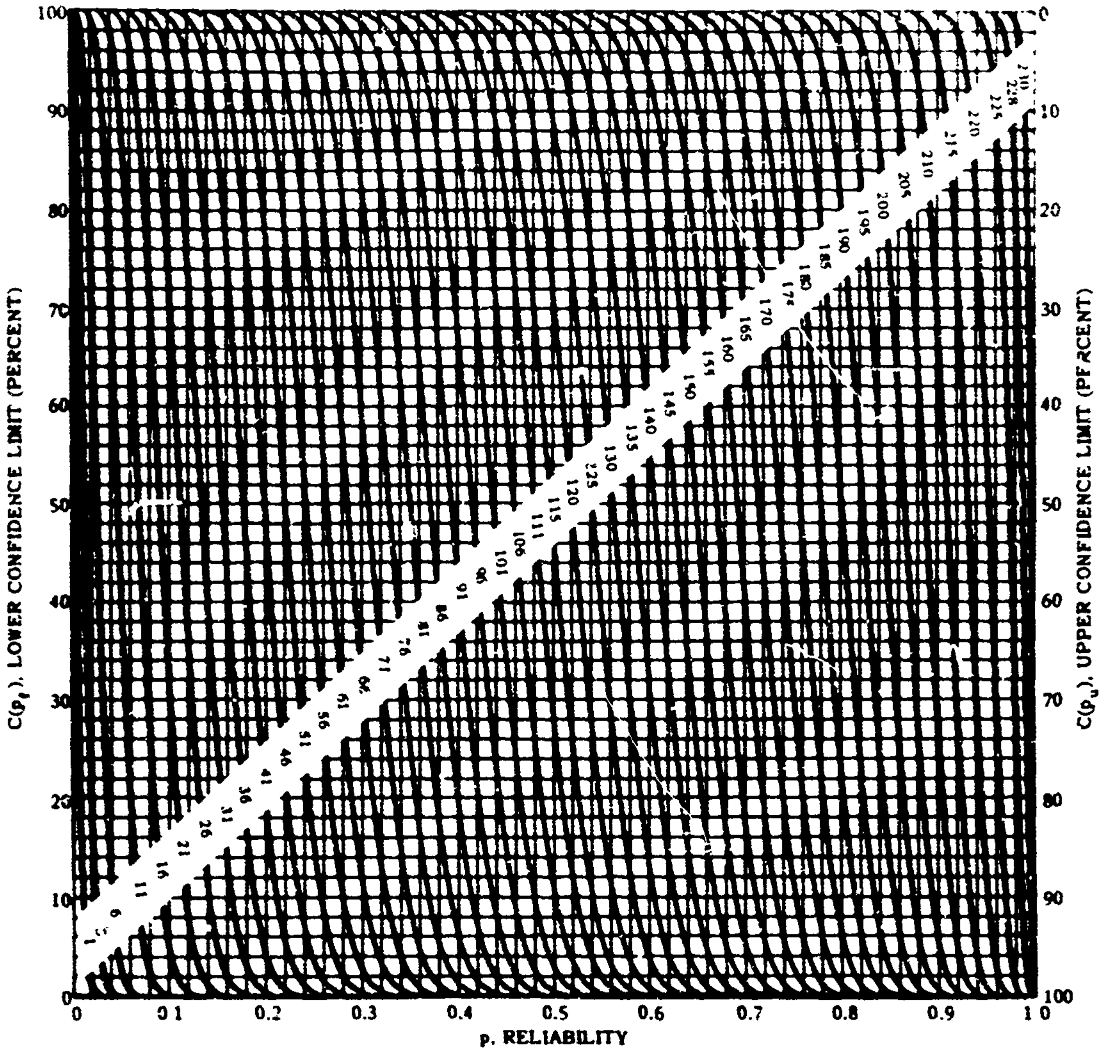
s (s − 1) = 1,0; 2,1; 3,2; ... 210,209
(s + 1), s = 1,0; 2,1; 3,2; ... 210,209
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 111. Reliability Curves for n = 210. (s numbers on curves; for p_u, values are 1 less.)



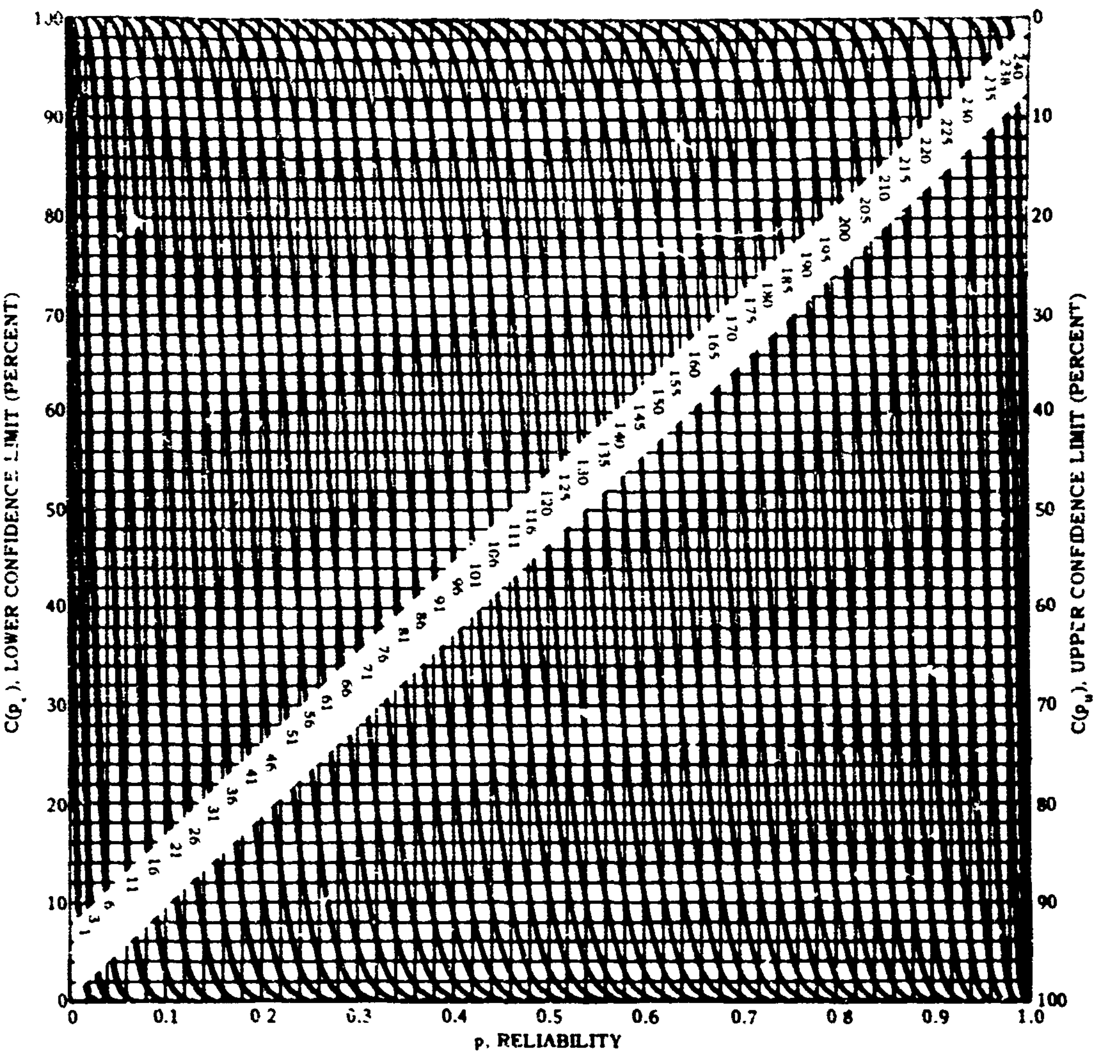
s, (s − 1) = 1,0; 2,1; 3,2; ...., 220,219
(s + 1), s = 1,0; 2,1; 3,2; ...., 220,219
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 112. Reliability Curves for n = 220. (s numbers on curves; for p_u, values are 1 less.)



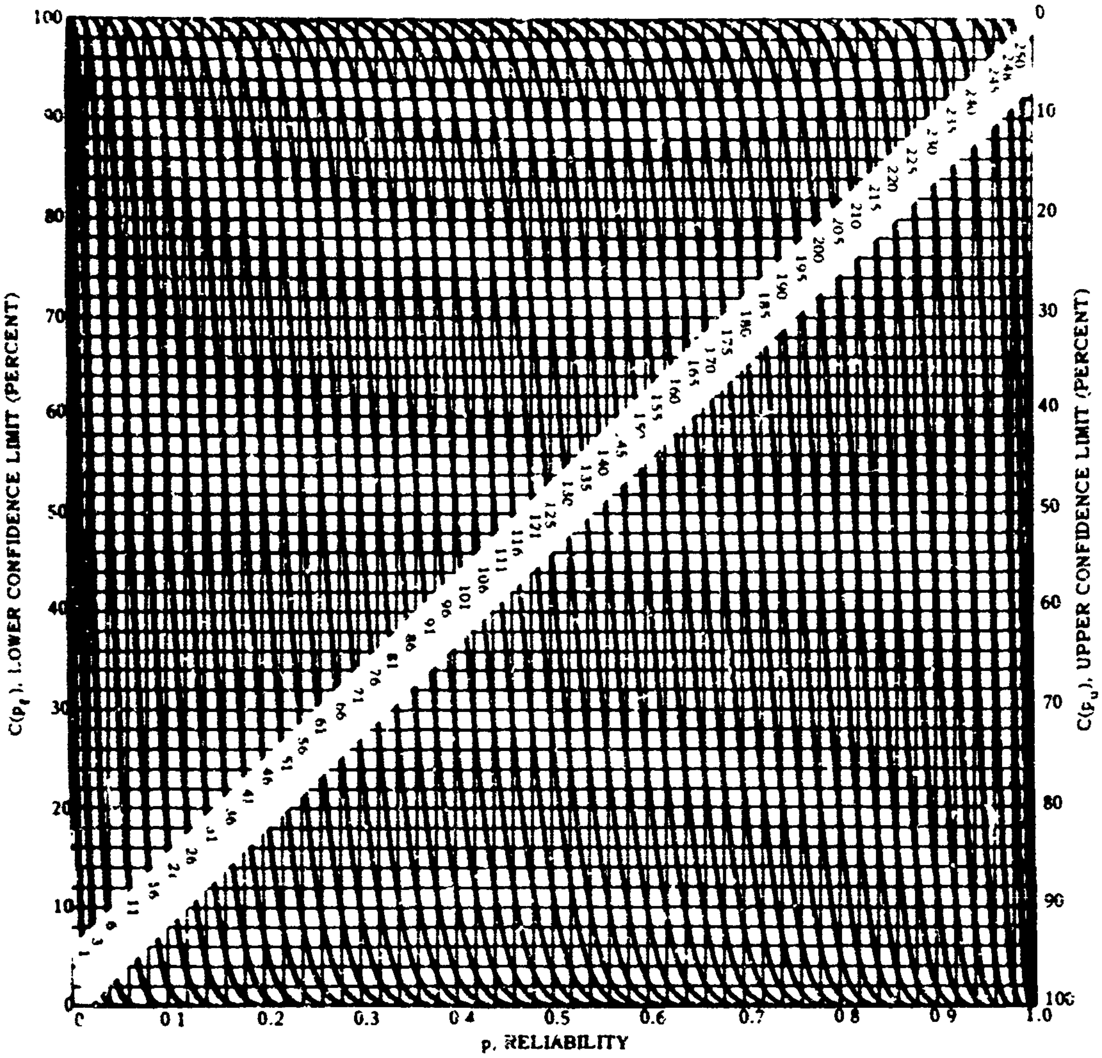
s, (s - 1) = 1,0; 2,1, 3,2, ..., 230,229
(s + 1), s = 1,0; 2,1; 3,2, ...; 230,229
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 113. Reliability Curves for n = 230. (s numbers on curves; for p_u, values are 1 less.)



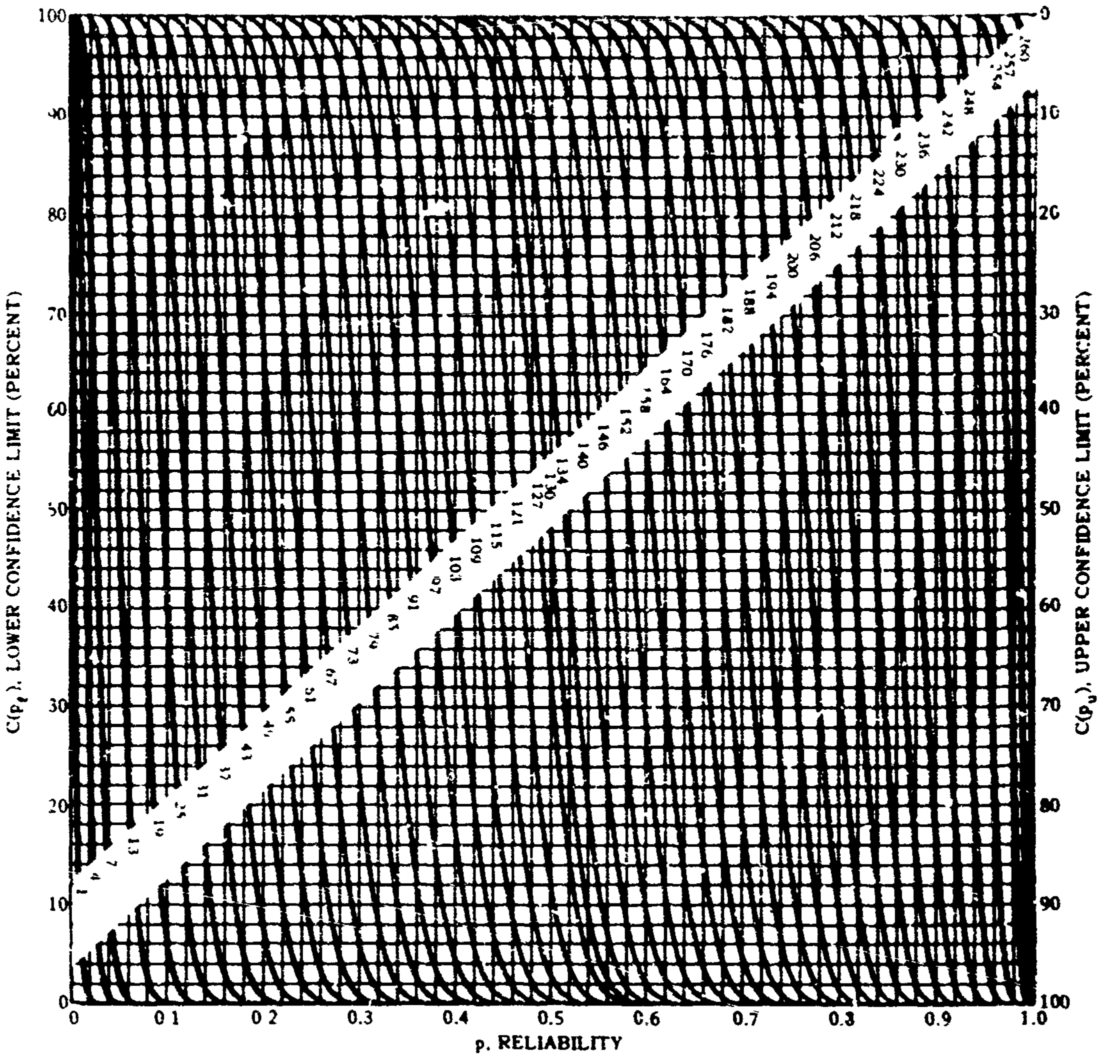
s, (s - 1) = 1,0; 2,1, 3,2, ... ; 240 239
(s + 1), s = 1 0, 2.1, 3,2, ... ; 240 239
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 114. Reliability Curves for n = 240. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2; ..., 250,249
(s + 1), s = 1,0; 2,1; 3,2; ..., 250,249
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 115. Reliability Curves for n = 250. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1, 3,2, …, 260,259

(s + 1), s = 1,0; 2,1, 3,2, …, 260,259

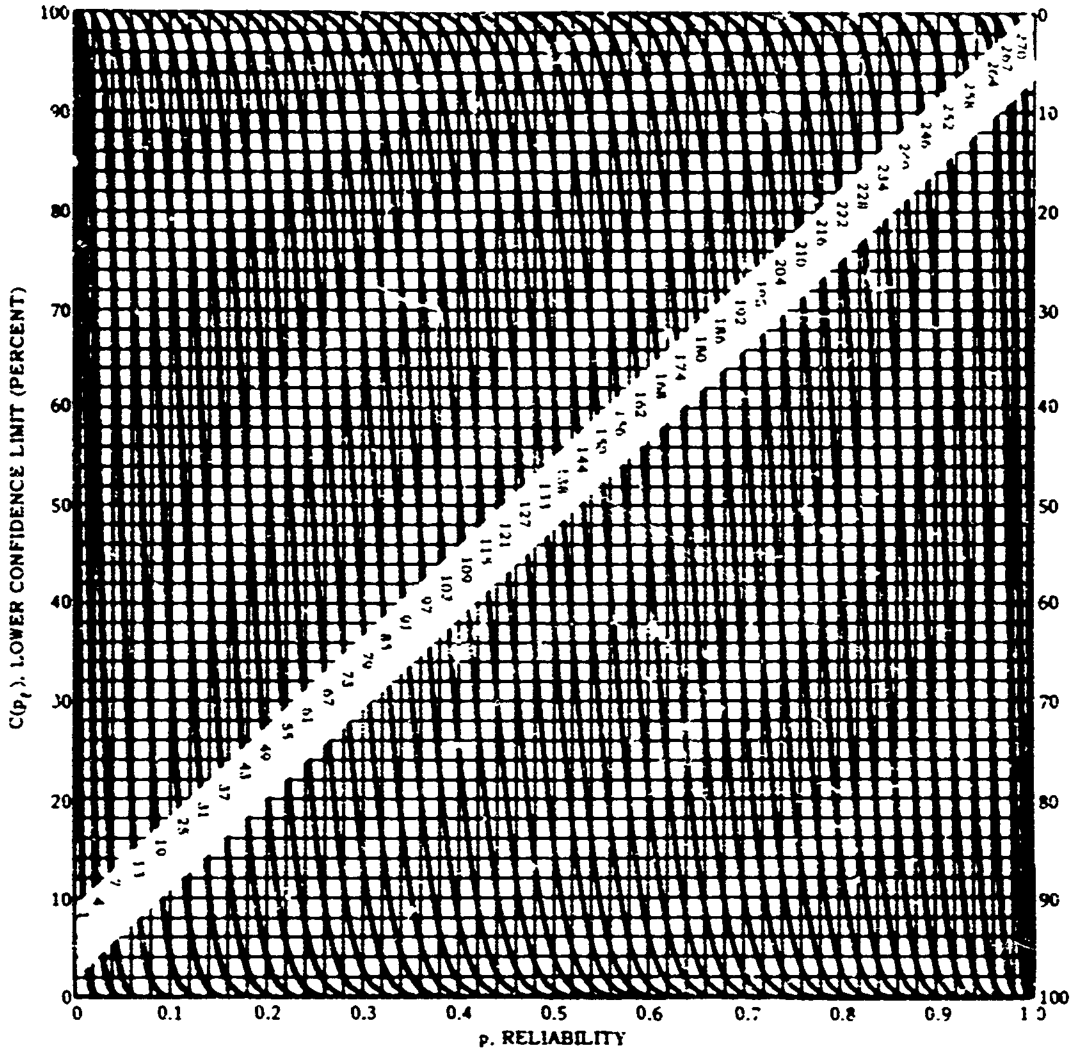
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

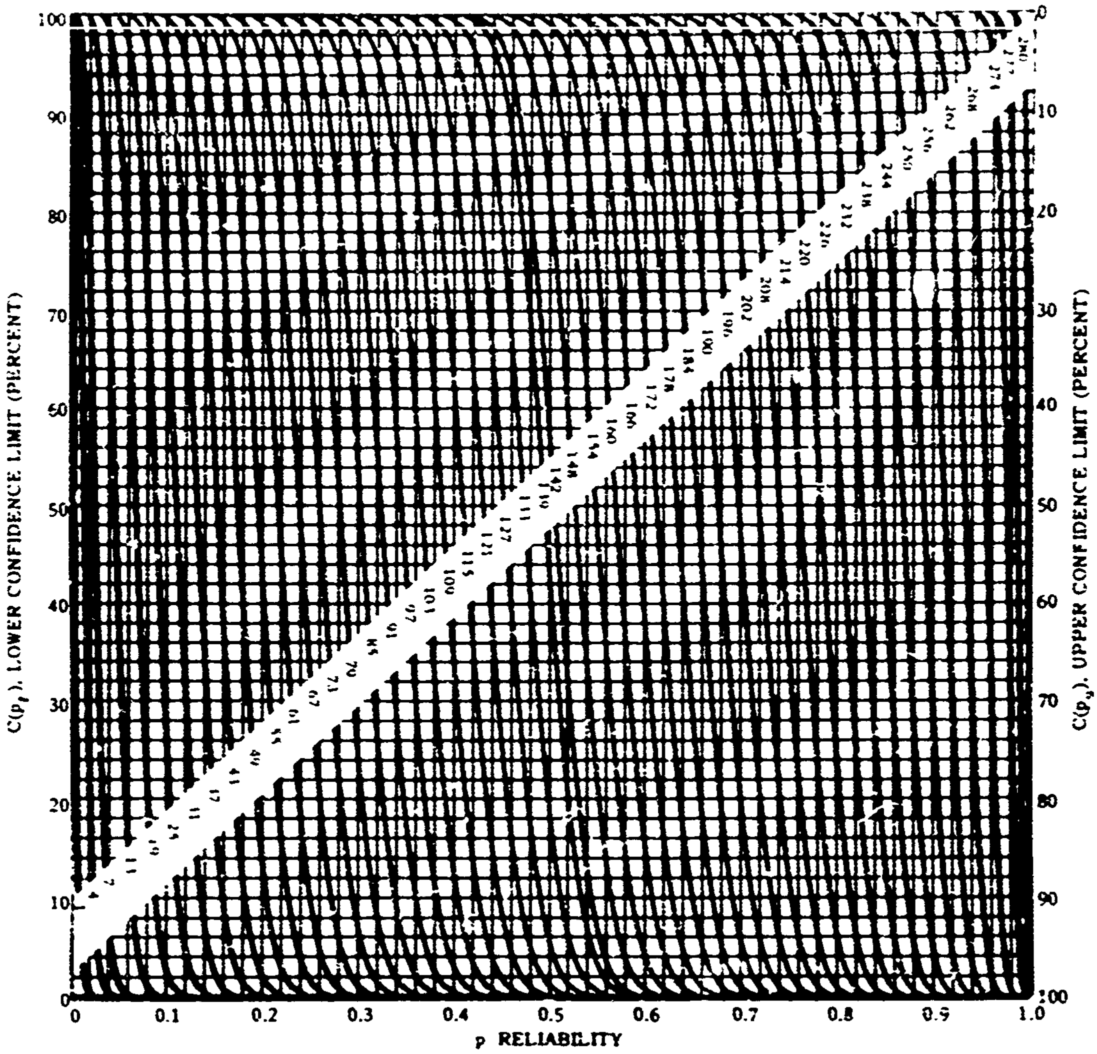
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 116. Reliability Curves for n = 260. (s numbers on curves; for p_u, values are 1 less.)



s (s - 1) = 1,0; 2,1; 3,2; . . . 270,269
(s + 1) s = 1 0; 2,1; 3,2; . . . 270 269
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 117. Reliability Curves for n = 270. (s numbers on curves; for p_u, values are 1 less.)



$s, (s - 1) = 1,0; 2,1; 3,2; \ldots, 280,279$

$(s + 1), s = 1,0; 2,1; 3,2, \ldots; 280,279$

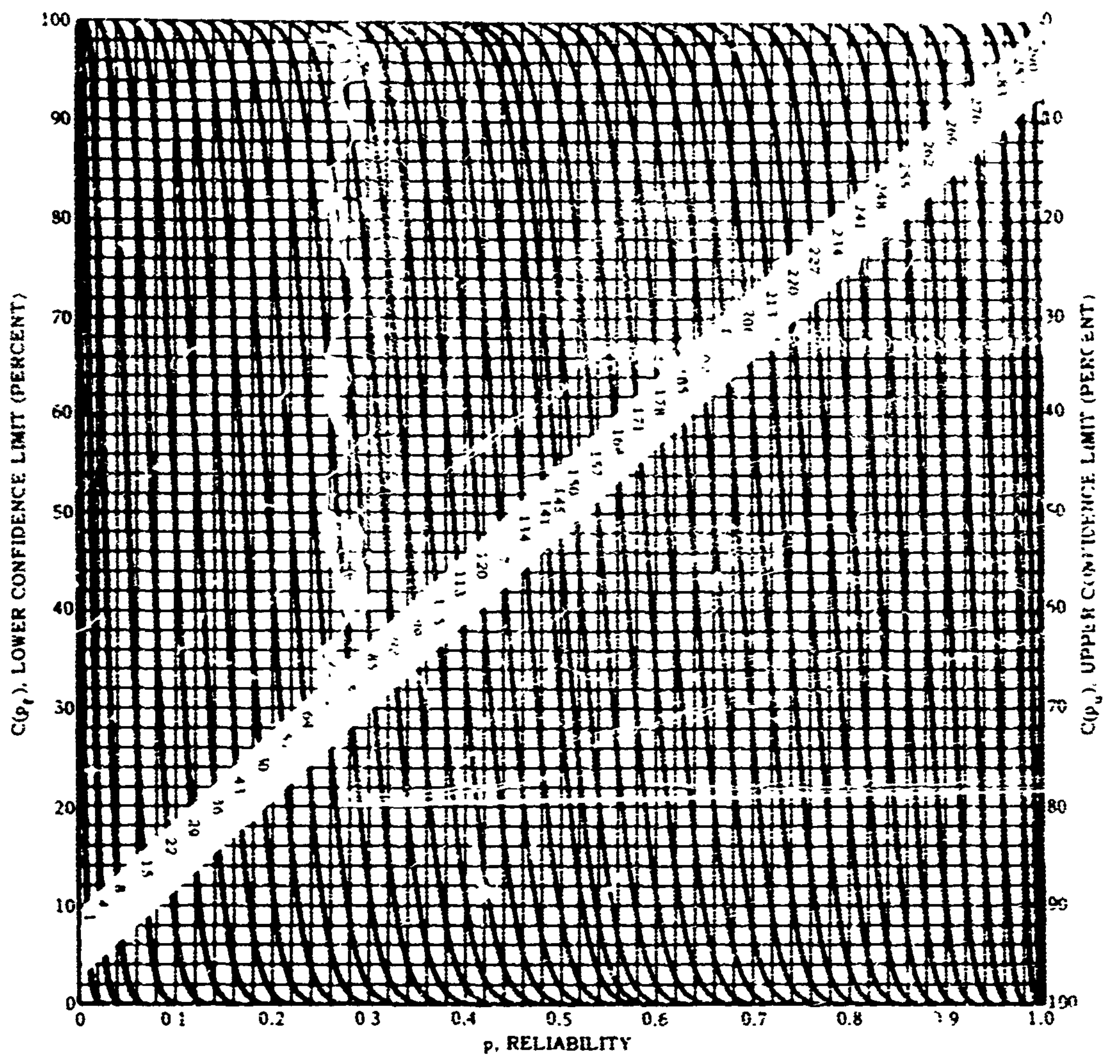
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

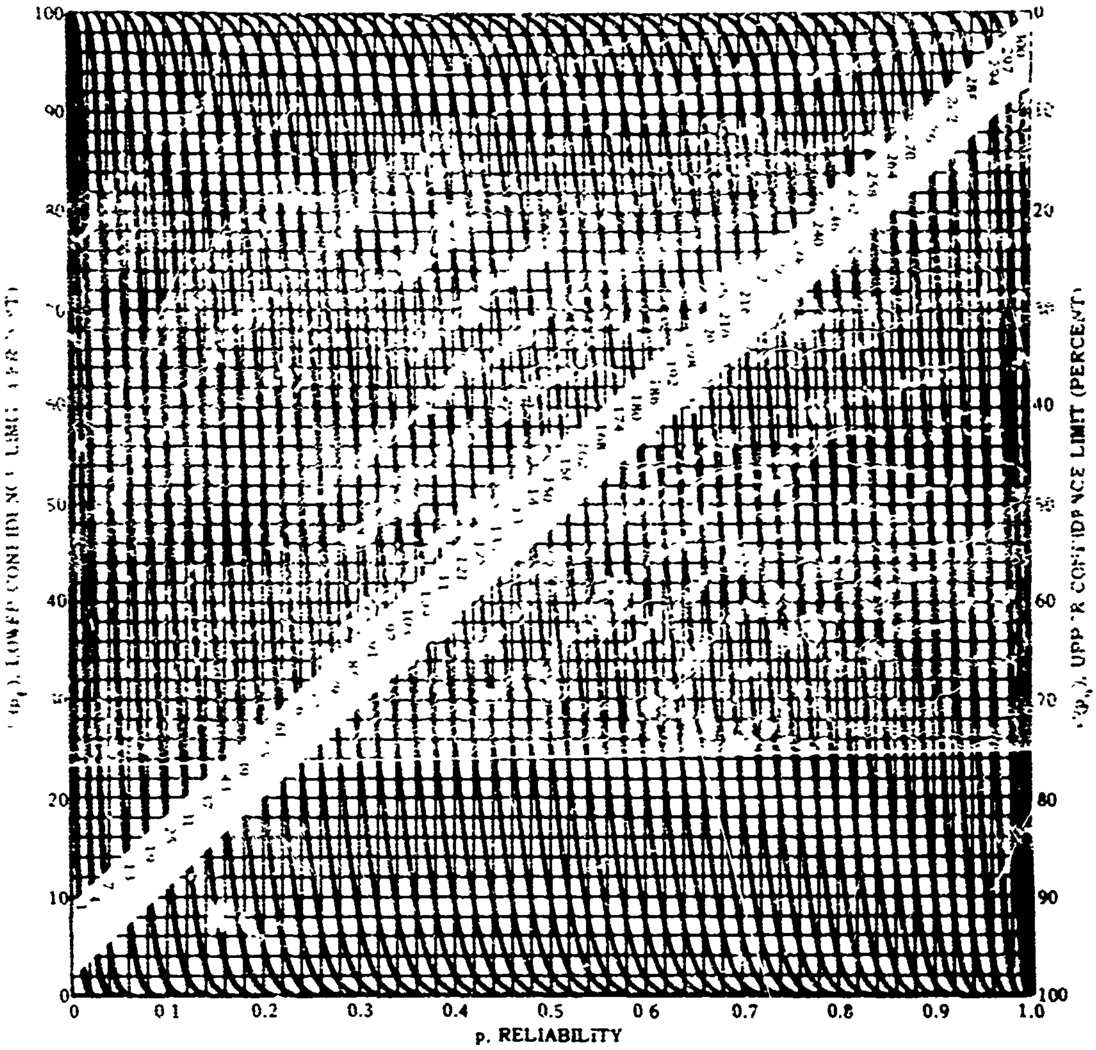
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 118. Reliability Curves for n = 280. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2, .. 290,289
(s + 1), s = 1 0; 2,1, 3,2 290,289
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 119. Reliability Curves for n = 290. (s numbers on curves; for p_u, values are 1 less.)



$s, (s - 1) = 1,0;\ 2,1;\ 3,2;\ \ldots;\ 300,299$

$(s + 1), s = 1,0;\ 2,1;\ 3,2;\ \ldots;\ 300,299$

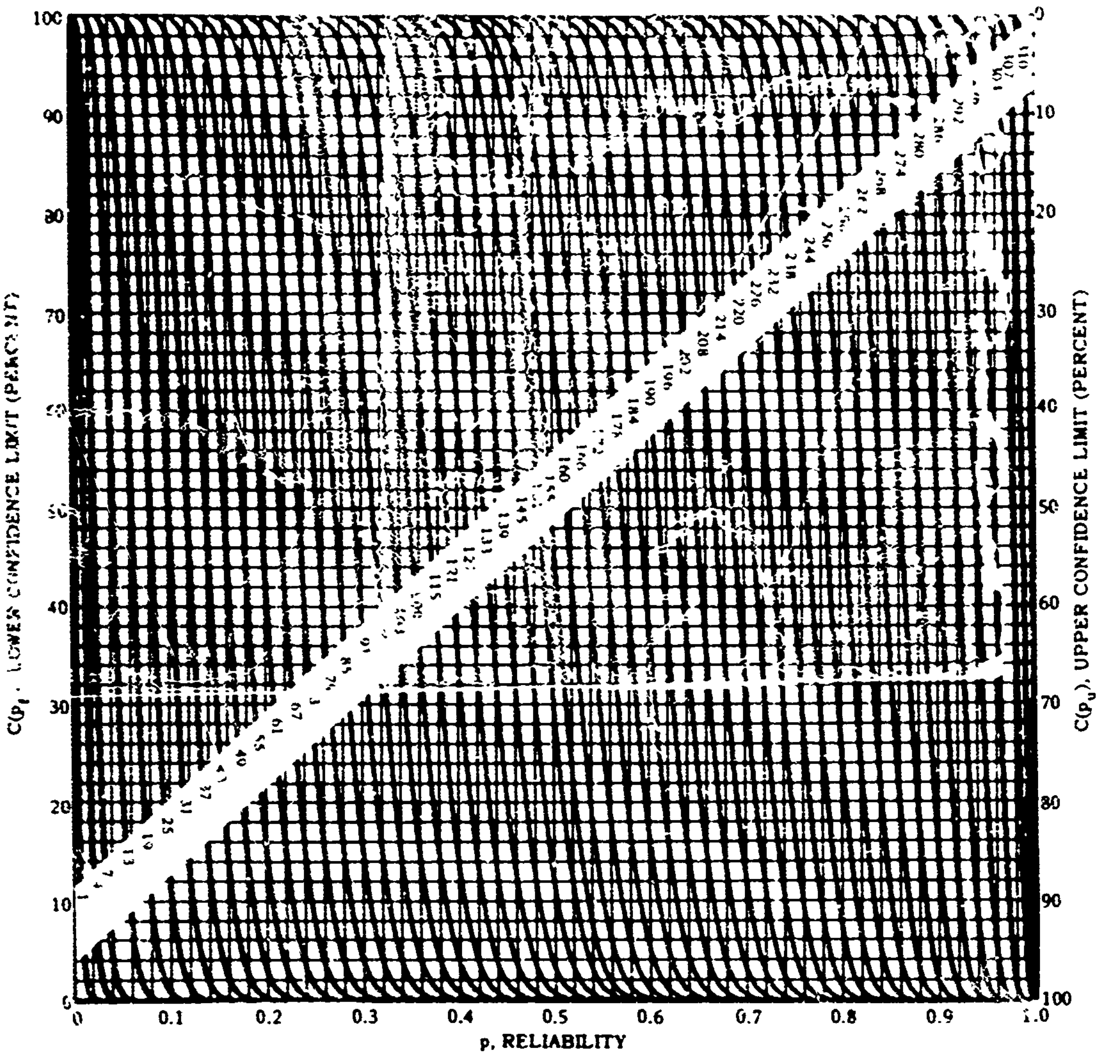
$C(p_\ell)$ IS DETERMINED FROM $s, (s - 1)$ CURVE

$C(p_u)$ IS DETERMINED FROM $(s + 1), s$ CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

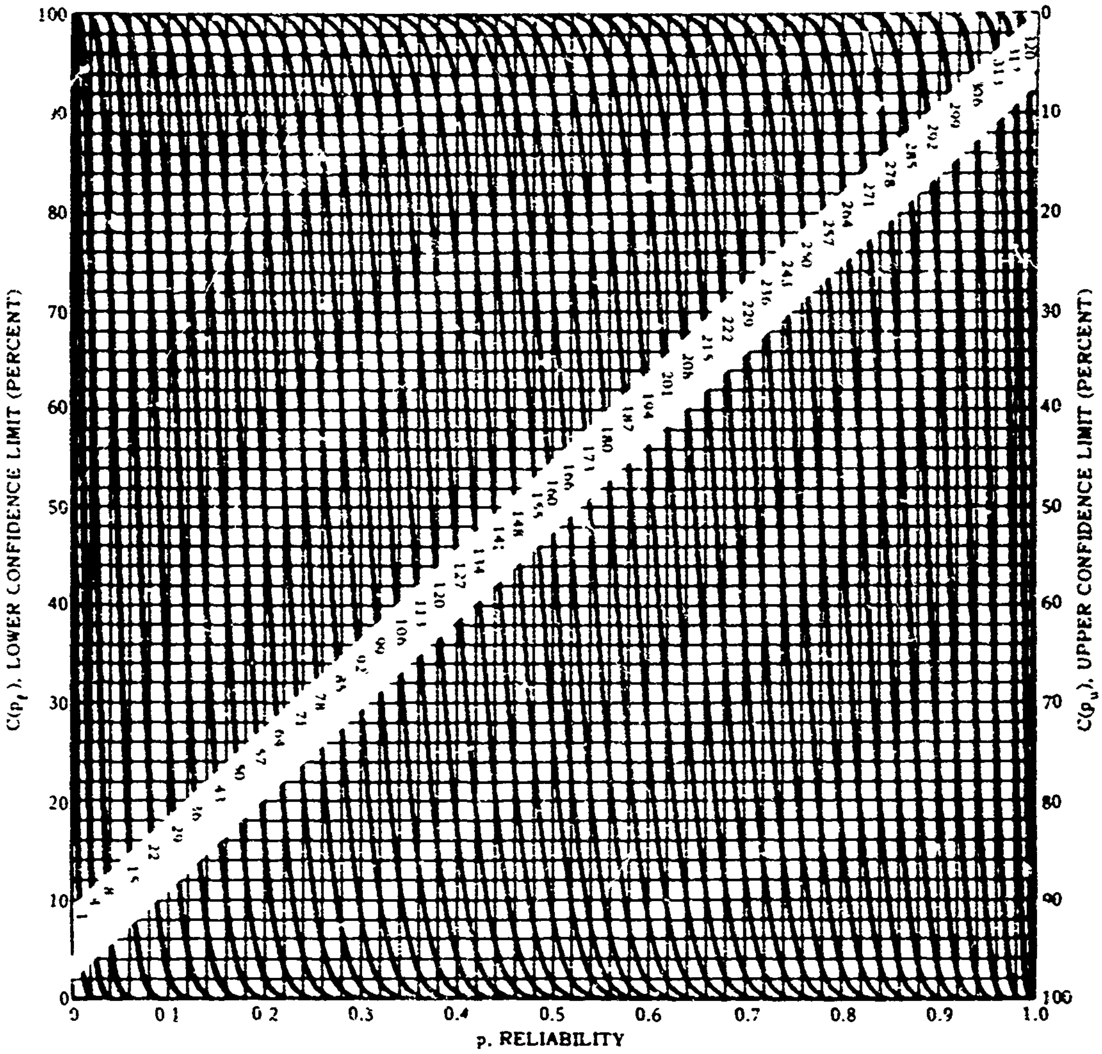
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 120. Reliability Curves for n = 300. (s numbers on curves; for p_u, values are 1 less.)



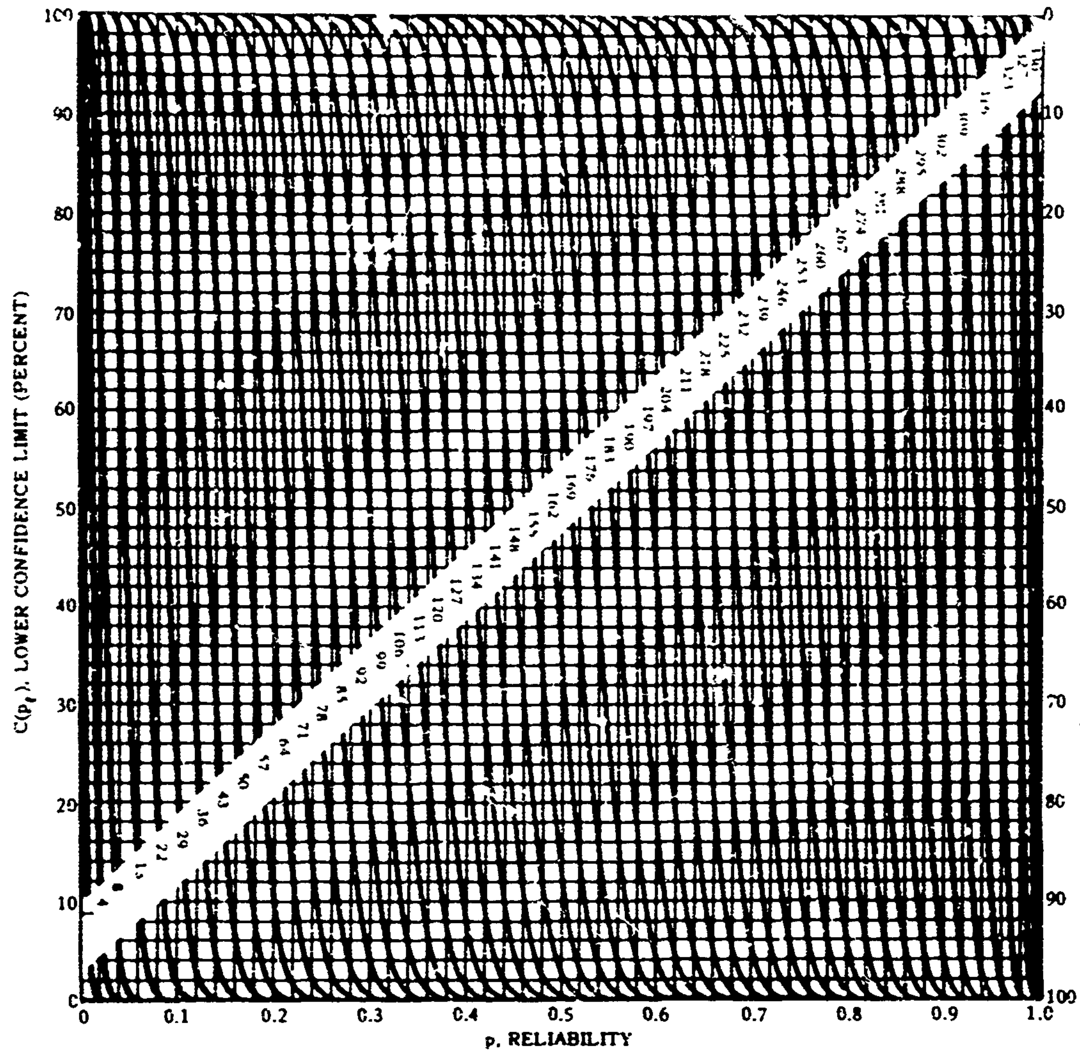
s, (s - 1) = 1,0, 2,1, 3,2; . . .; 310,309
(s + 1), s = 1,0; 2,1, 3,2; ...; 310,309
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 121. Reliability Curves for n = 310. (s numbers on curves; for p_u, values are 1 less.)



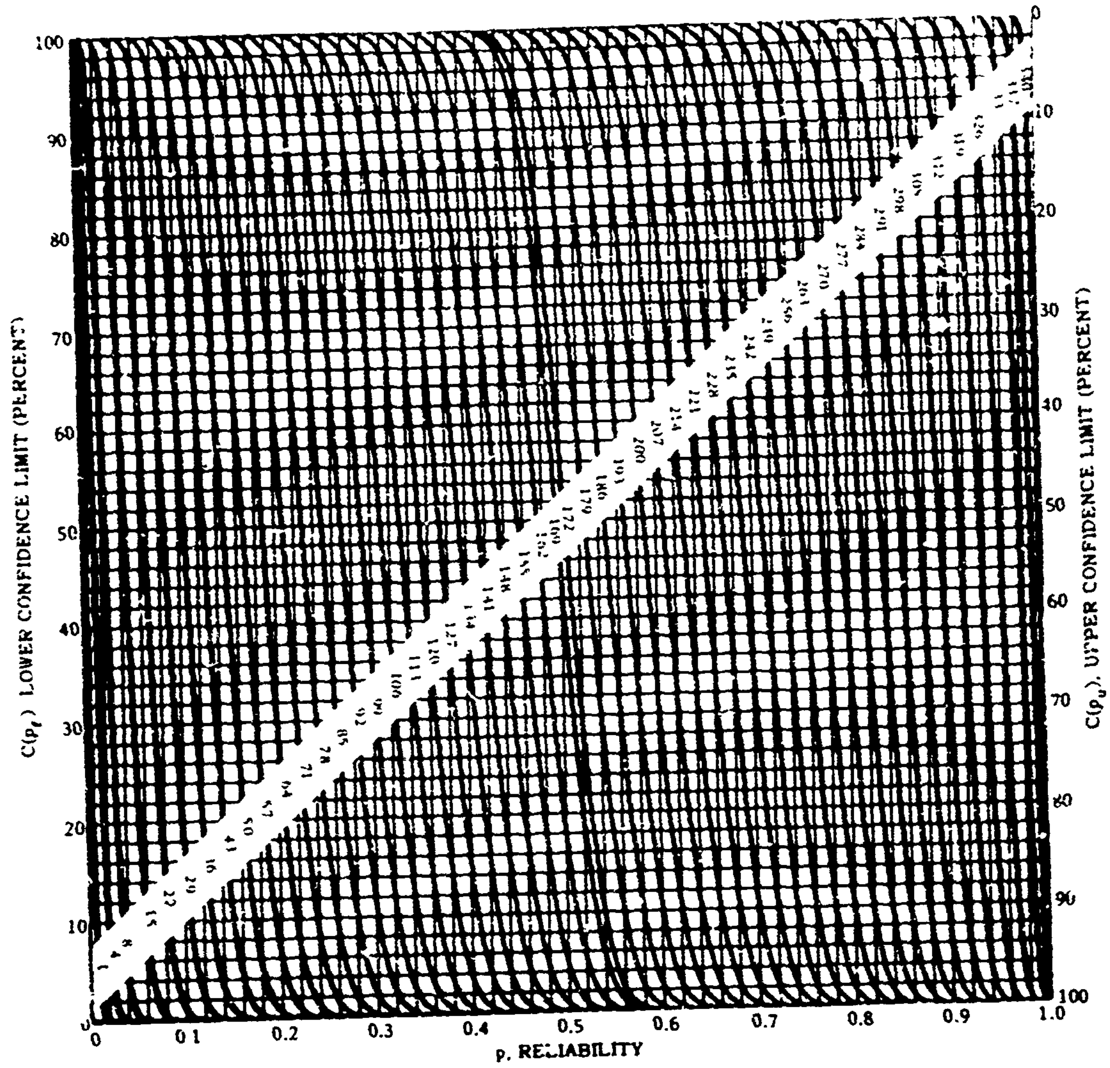
s, (s - 1) = 1,0; 2,1; 3,2; .. 320 319
(s + 1), s = 1 0, 2,1; 3 2, . . , 320 319
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 122. Reliability Curves for n = 320. (s numbers on curves; for p_u, values are 1 less.)



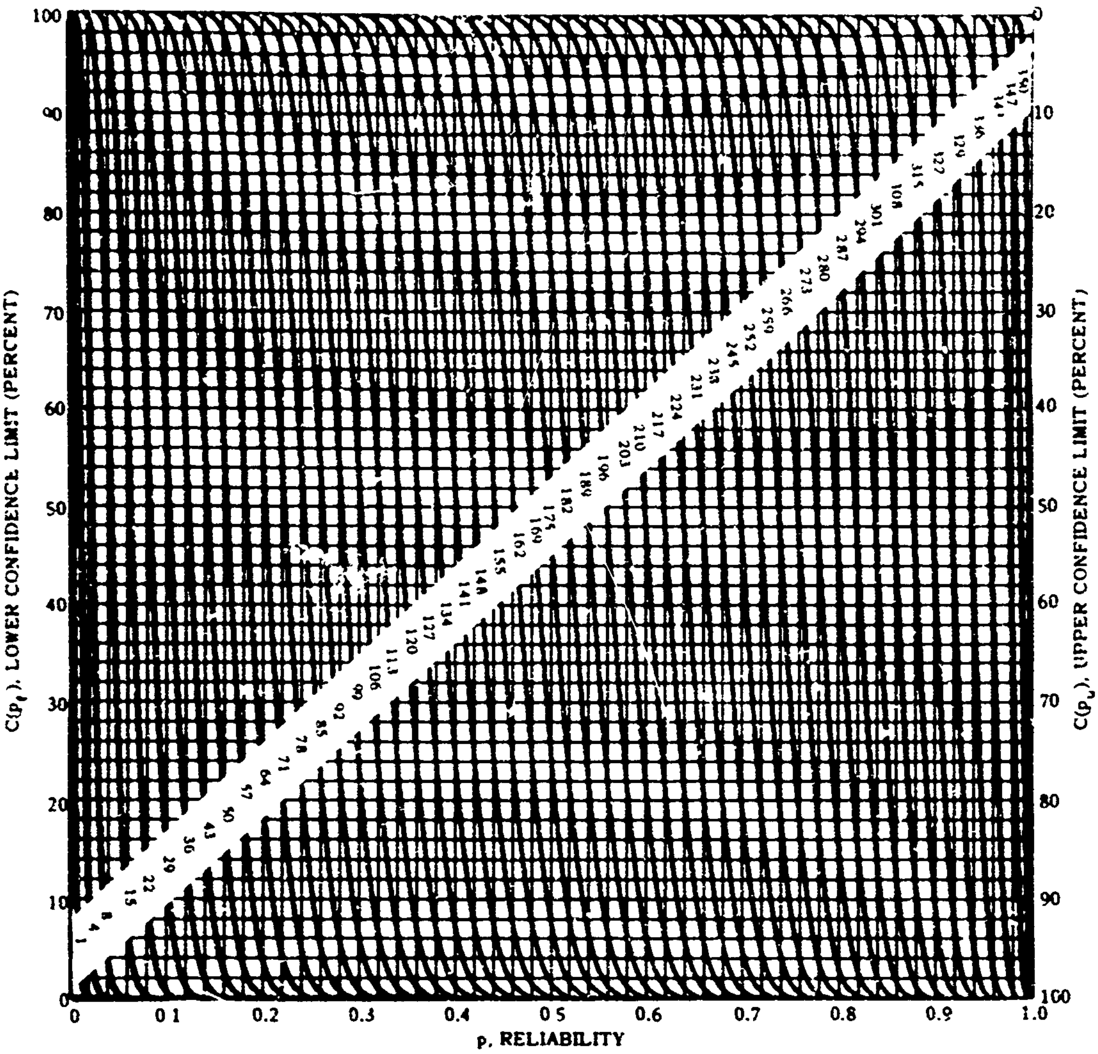
s, (s - 1) = 1,0; 2,1; 3,2; . . ., 330,329
(s + 1), s = 1,0; 2,1; 3,2, ...; 330,329
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 123. Reliability Curves for n = 330. (s numbers on curves; for p_u, values are 1 less.)



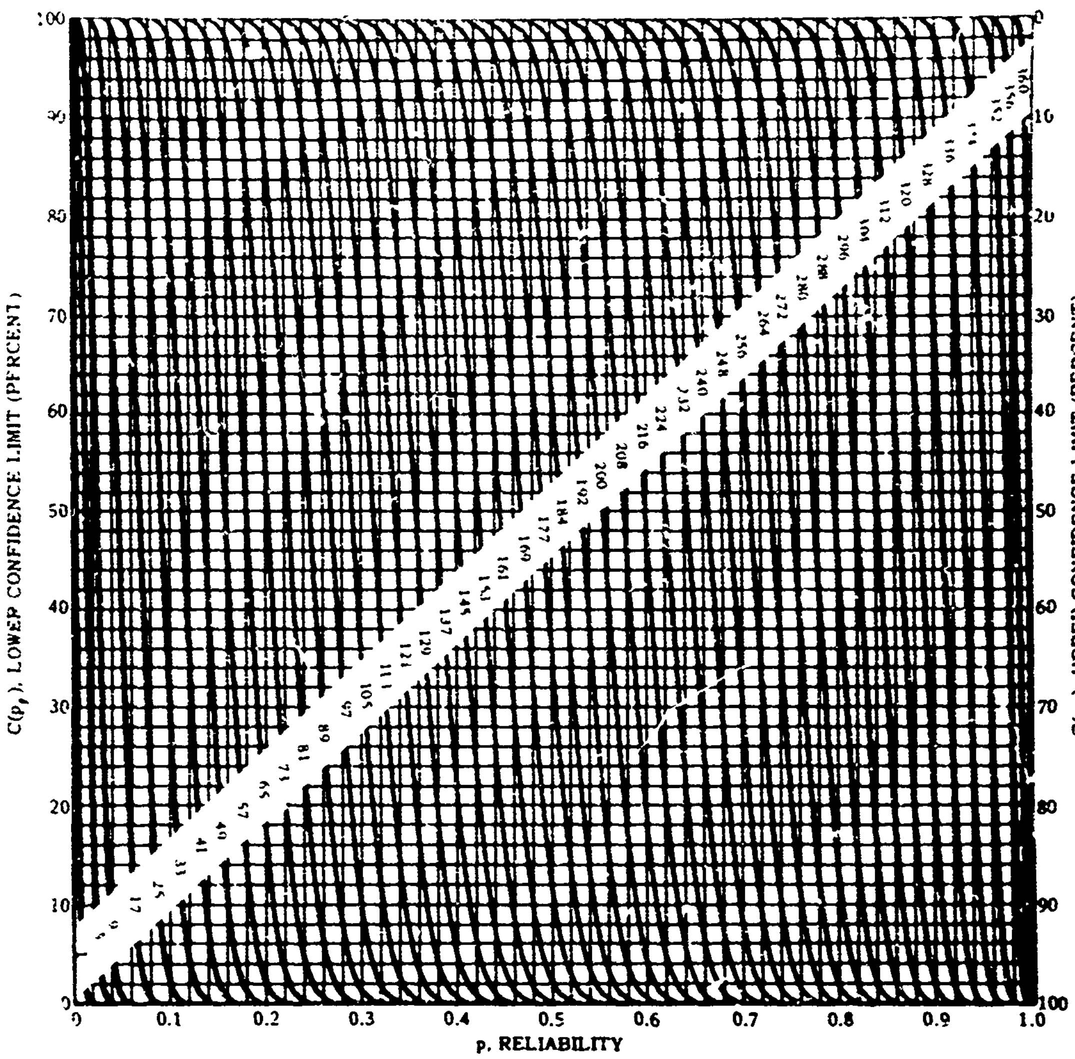
$s, (s-1) = 1,0; 2,1; 3,2; \ldots; 340,339$
$(s+1), s = 1,0; 2,1; 3,2, \ldots; 340\ 339$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 124. Reliability Curves for $n = 340$. (s numbers on curves; for p_u, values are 1 less.)



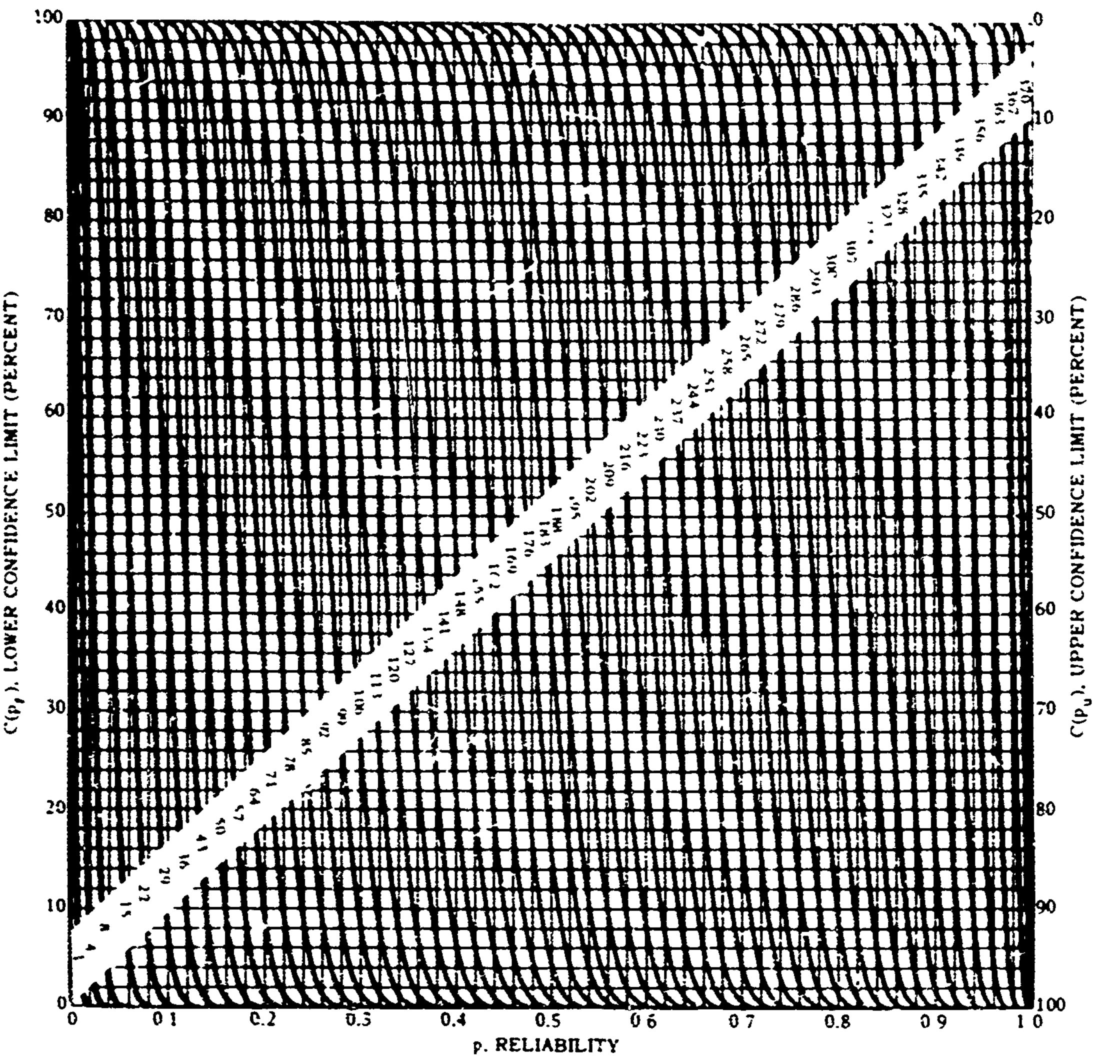
s, (s - 1) = 1,0; 2,1; 3,2; ..., 350,349
(s + 1), s = 1,0; 2,1; 3,2, ..., 350,349
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 125. Reliability Curves for n = 350. (s numbers on curves; for p_u, values are 1 less.)



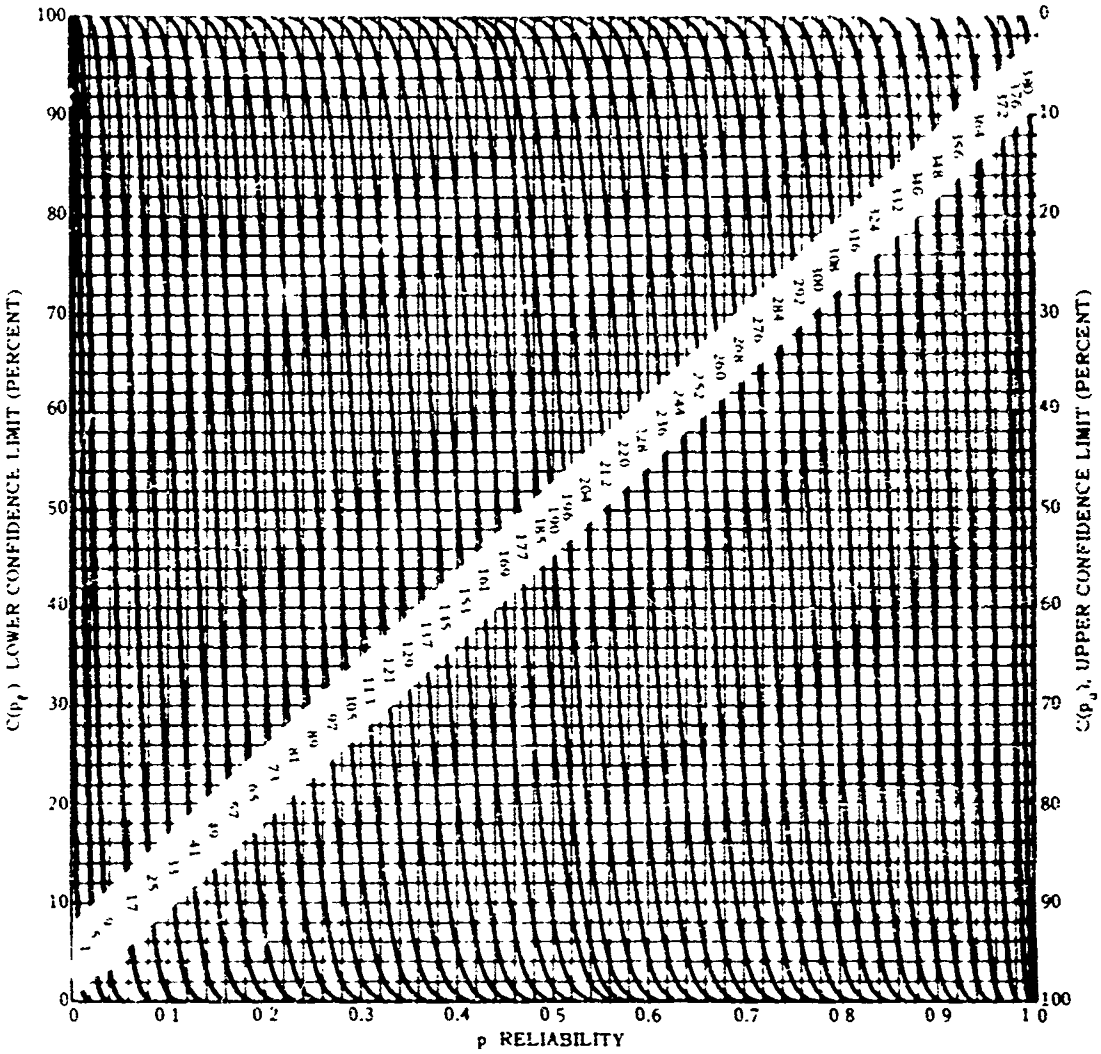
a. (s − 1) = 1,0; 2,1; 3,2; ...; 360 359
(s + 1) s = 1.0; 2,1; 3,2, ...; 360,359
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 126. Reliability Curves for n = 360. (s numbers on curves; for p_u, values are 1 less.)



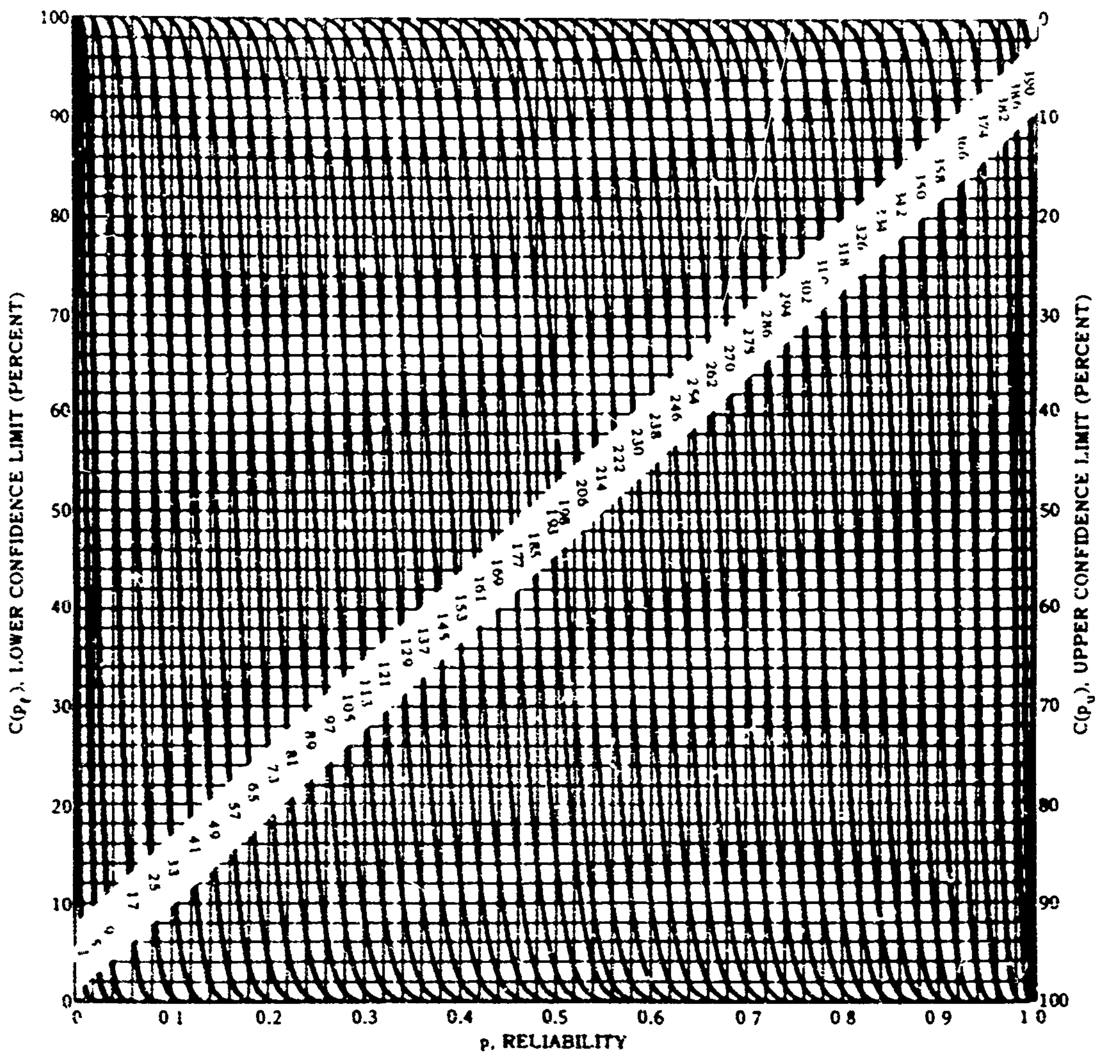
s (s - 1) = 1,0; 2,1, 3,2, . . . 370 369
(s + 1) s = 1 0; 2,1, 3,2, . . . 370 369
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 127. Reliability Curves for n = 370. (s numbers on curves; for p_u, values are 1 less.)



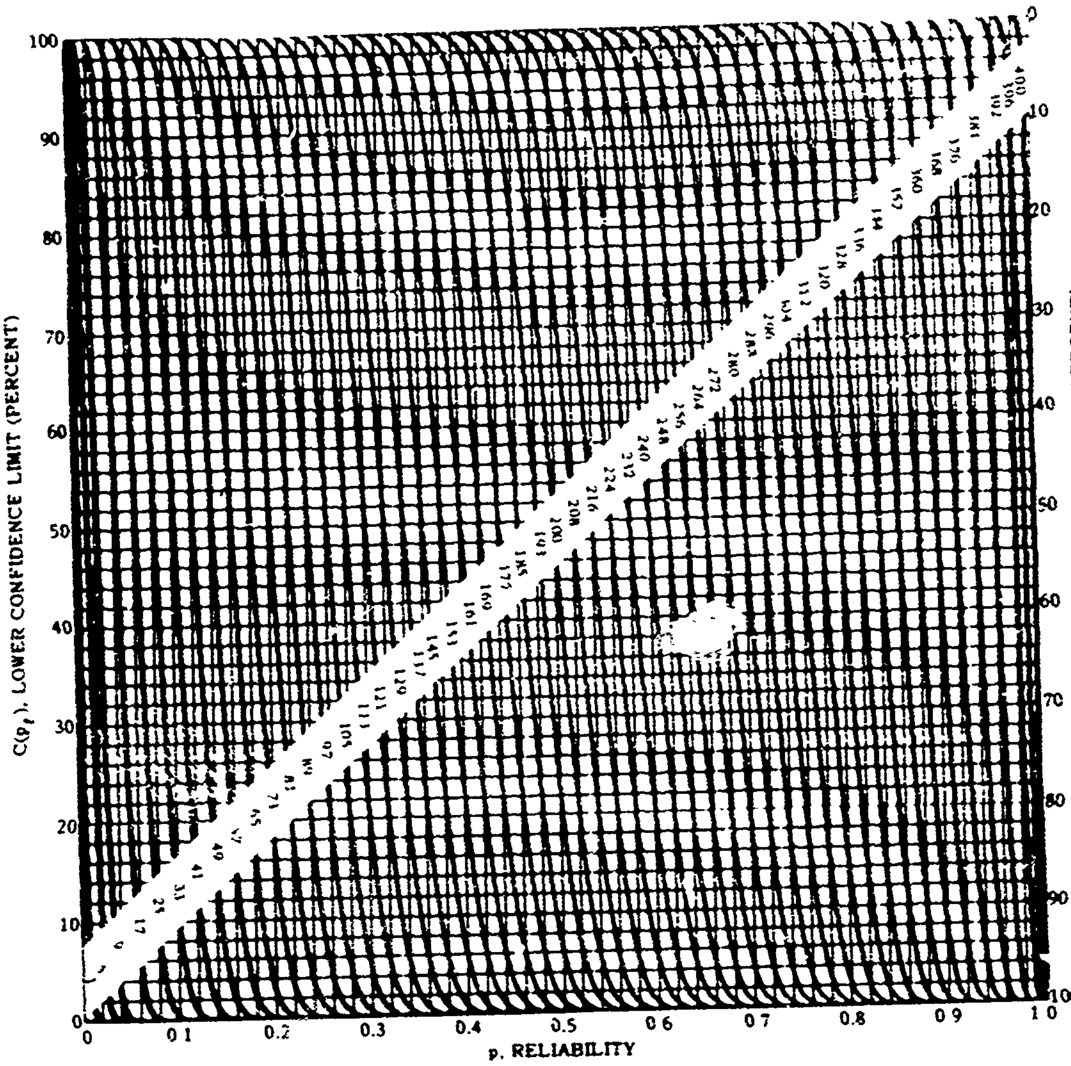
s, (s - 1) = 1,0; 2,1, 3,2, . . . 380, 379
(s + 1), s = 1,0, 2,1, 3,2, . . . 380, 379
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 128. Reliability Curves for n = 380. (s numbers on curves; for p_u, values are 1 less.)



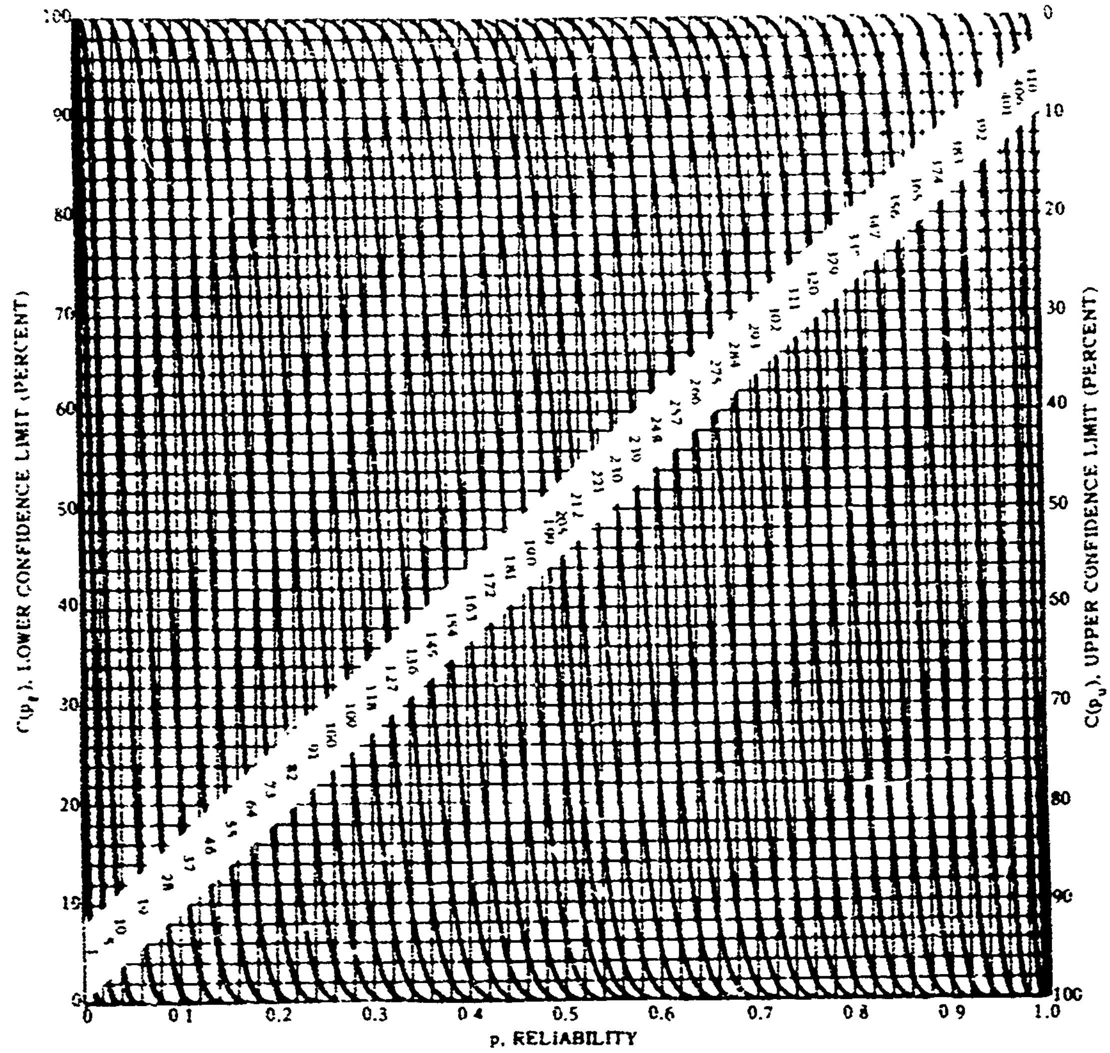
$s, (s-1) = 1,0;\ 2,1;\ 3,2;\ \ldots;\ 390,389$
$(s+1), s = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 390,389$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 129. Reliability Curves for n = 390. (s numbers on curves; for p_u, values are 1 less.)



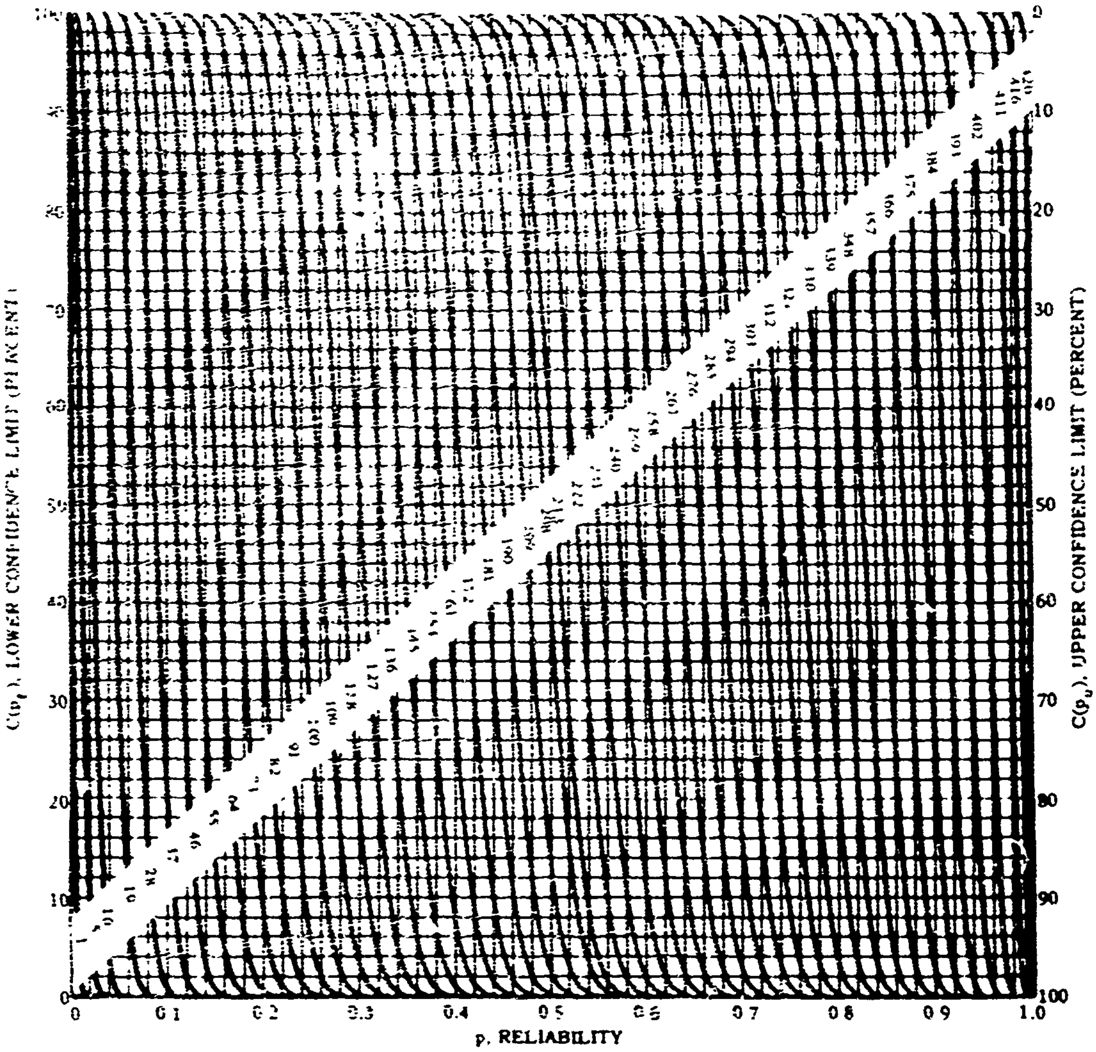
s, (s − 1) = 1,0; 2,1; 3,2; ... 400 399
(s + 1), s = 1 0; 2,1; 3,2; . 400 399
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 130 Reliability Curves for n = 400. (s numbers on curves; for p_u, values are 1 less.)



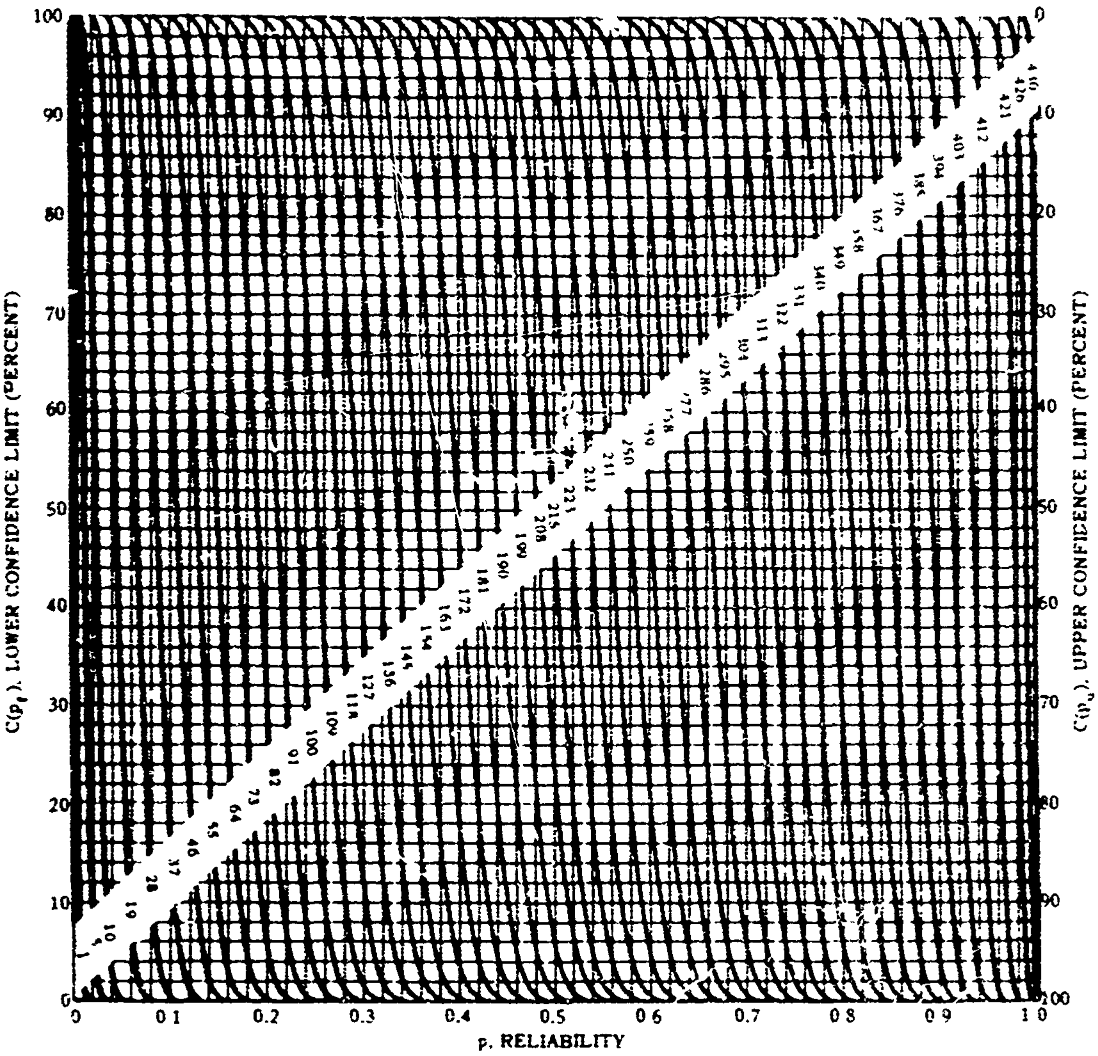
s, (s - 1) = 1,0; 2,1; 3,2, ... 410,409
(s + 1), s = 1,0; 2,1; 3,2, ... 410,409
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 131. Reliability Curves for n = 410. (s numbers on curves; for p_u, values are 1 less.)



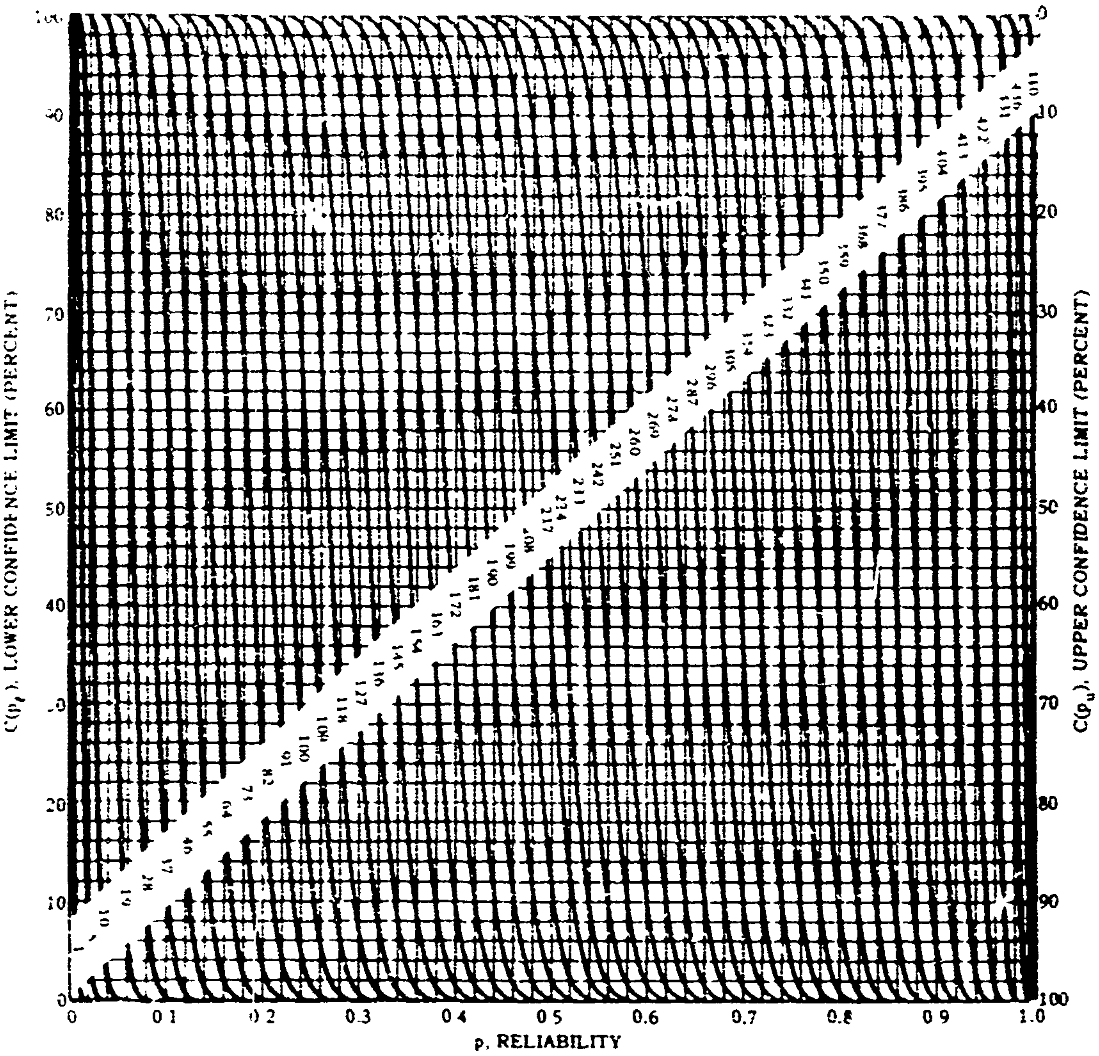
$s, (s-1) = 1,0; 2,1; 3,2; \ldots, 420,419$
$(s+1), s = 1,0; 2,1; 3,2; \ldots, 420,419$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 132. Reliability Curves for n = 420. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2, . . . , 430,429
(s + 1), s = 1,0, 2,1, 3,2, . . . , 430,429
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 133. Reliability Curves for n = 430. (s numbers on curves; for p_u, values are 1 less.)



s (s - 1) = 1.0, 2.1, 3.2, . . . , 440 439

(s + 1) s = 1 0, 2.1, 3.2, . . . , 440 439

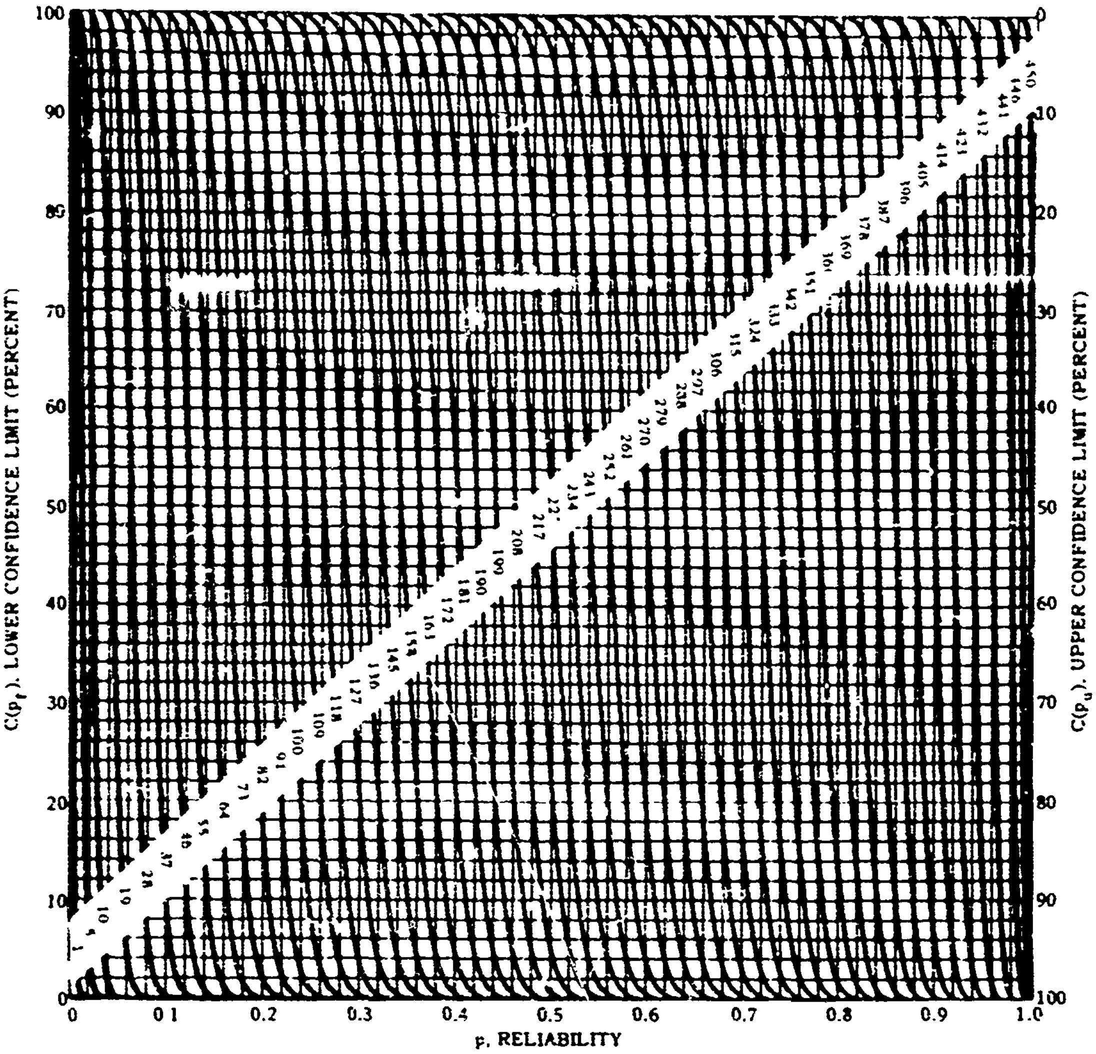
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)

RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 134. Reliability Curves for n = 440. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ... ; 450,449

(s + 1), s = 1,0; 2,1; 3,2 ; 450,449

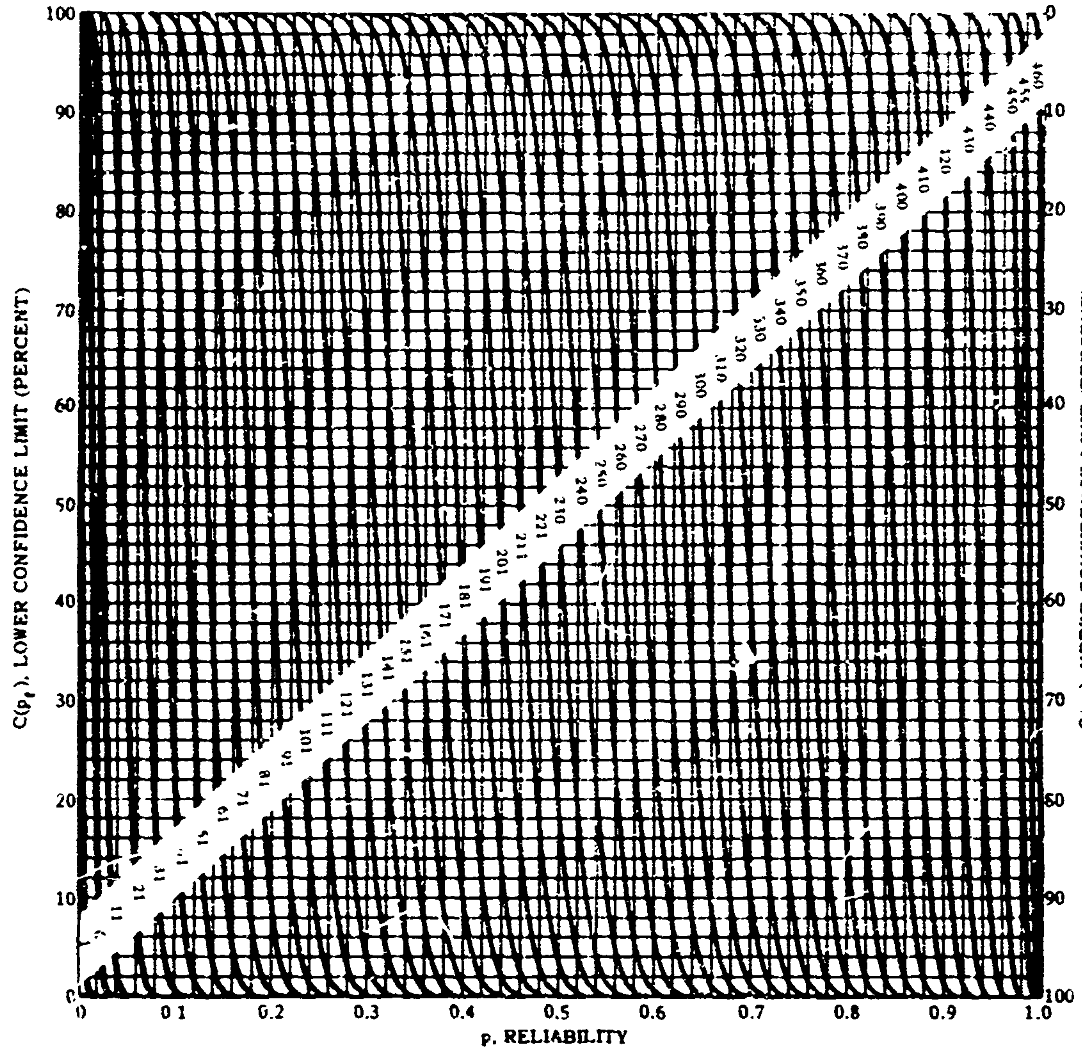
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − $C(p_\ell)$

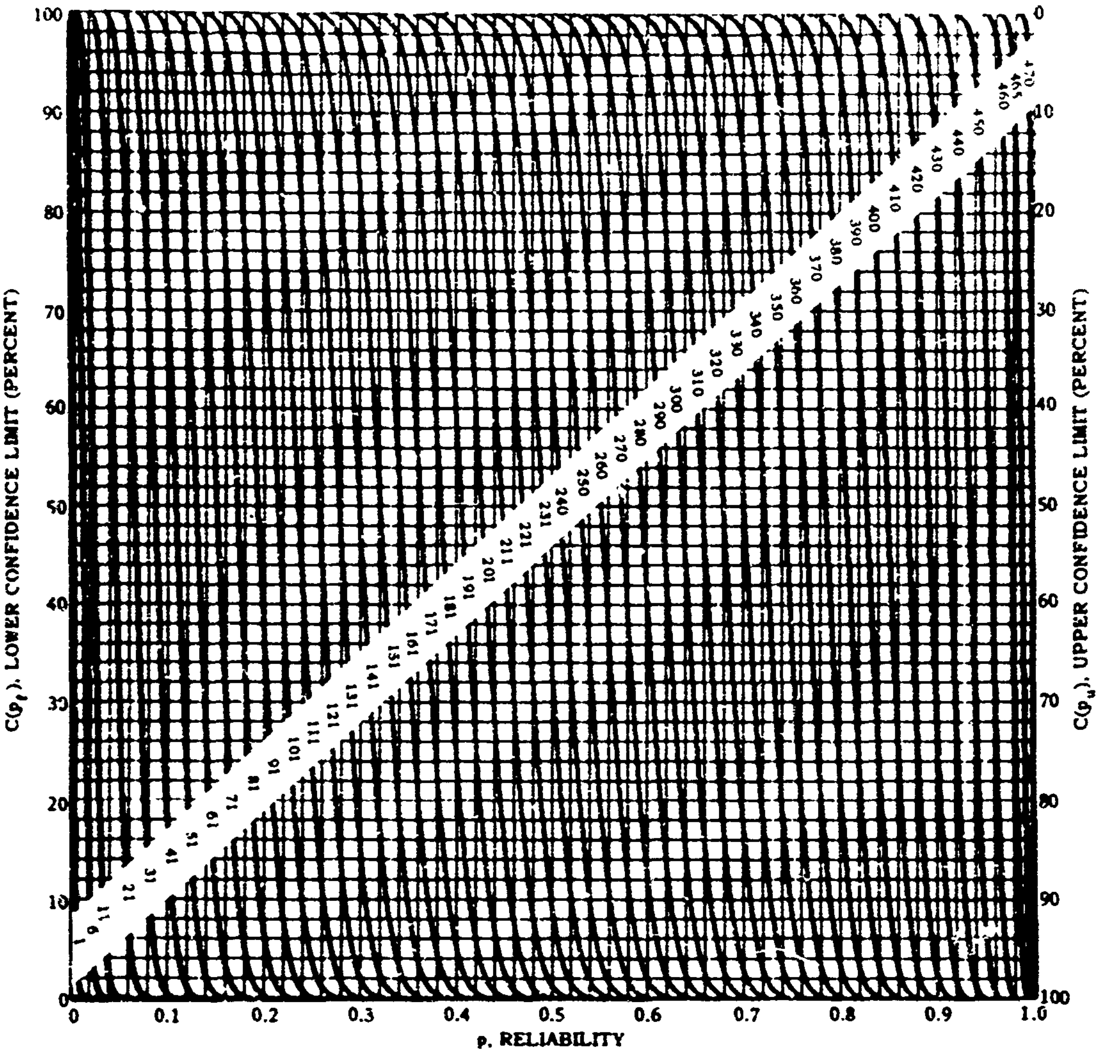
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − $C(p_u)$

Figure 135. Reliability Curves for n = 450. (s numbers on curves; for p_u, values are 1 less.)



s, (s - 1) = 1,0; 2,1; 3,2; . . .; 460,459
(s + 1), s = 1,0; 2,1, 3,2; . . ., 460,459
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 136. Reliability Curves for n = 450. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ...; 470,469

(s + 1), s = 1,0; 2,1; 3,2; ...; 470,469

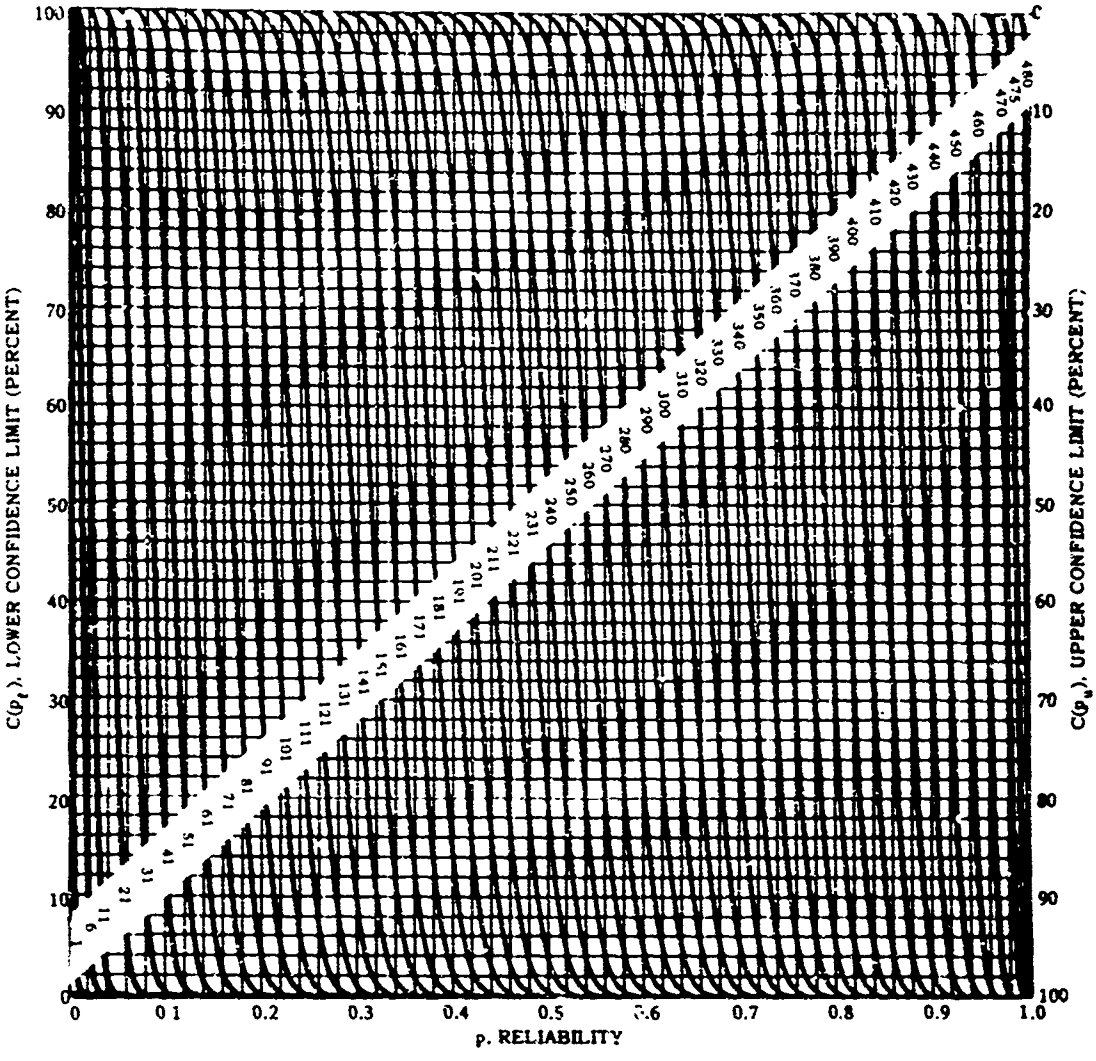
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)

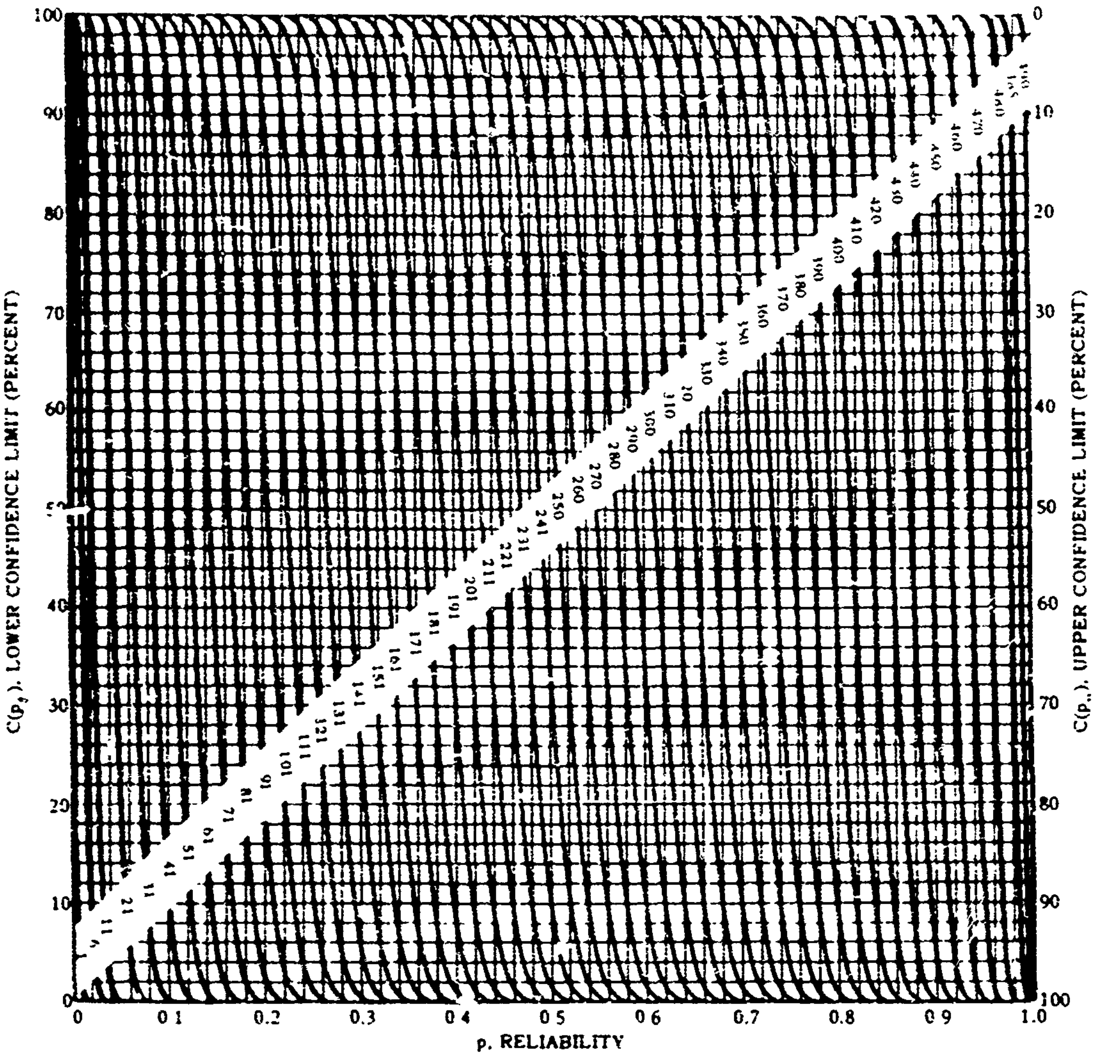
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 137. Reliability Curves for n = 470. (s numbers on curves; for p_u, values are 1 less.)



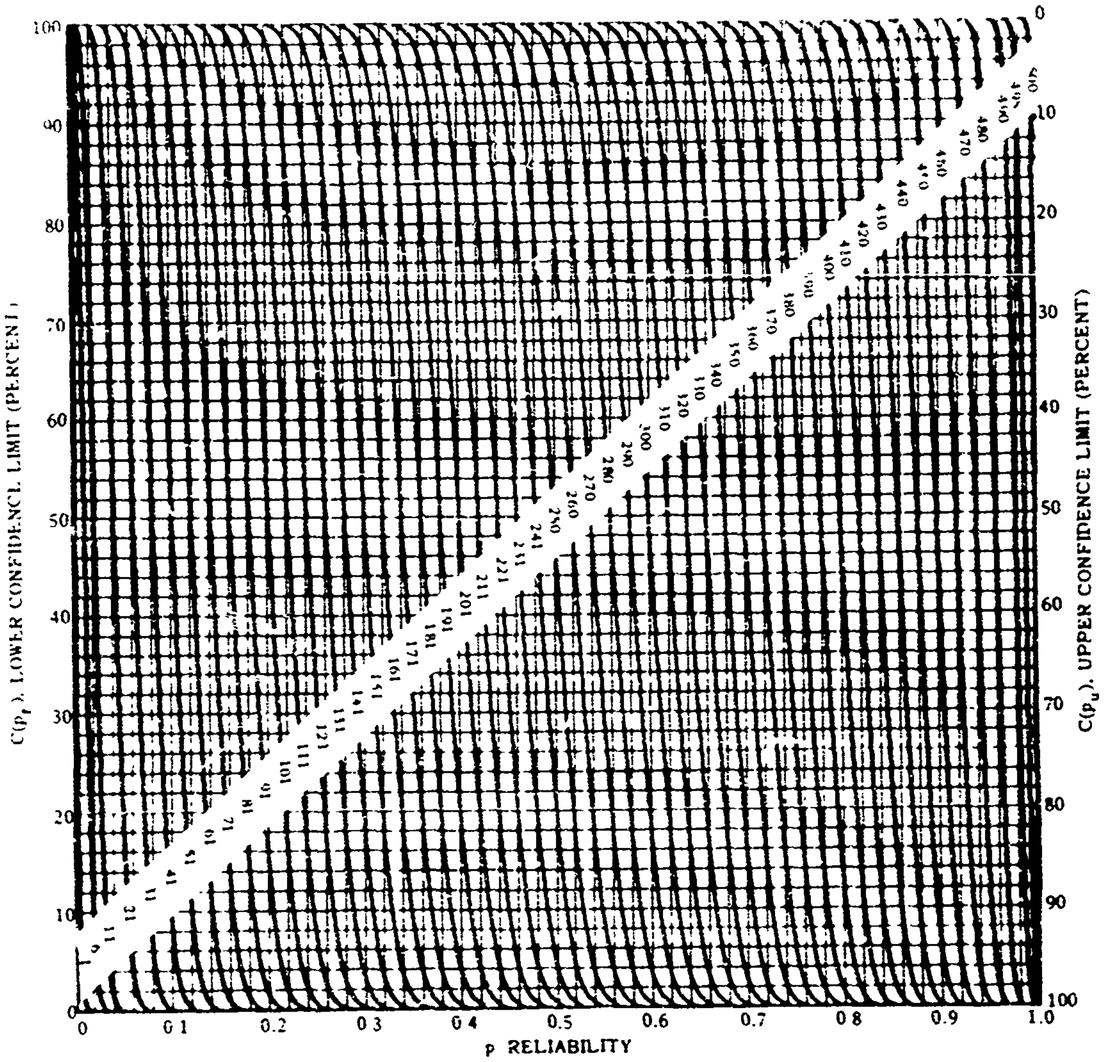
s, (s - 1) = 1,0; 2,1; 3,2; ..., 480,479
(s + 1), s = 1.0; 2,1; 3,2, ...; 480 479
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 138. Reliability Curves for n = 480. (s numbers on curves; for p_u, values are 1 less.)



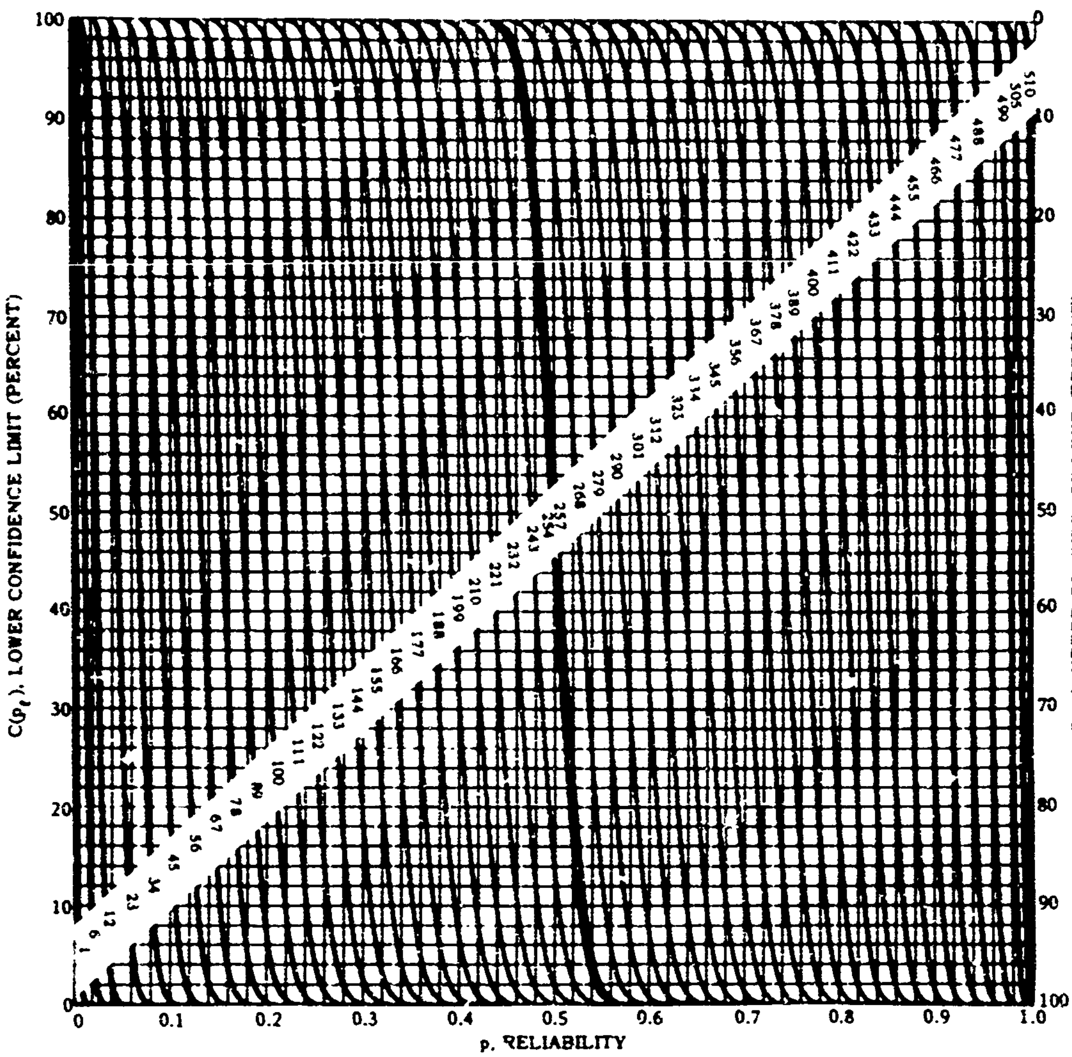
s, (s - 1) = 1,0, 2,1, 3,2, . . ., 490,489
(s + 1), s = 1,0, 2,1, 3,2, . . ., 490,489
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 139. Reliability Curves for n = 490. (s numbers on curves; for p_u, values are 1 less.)



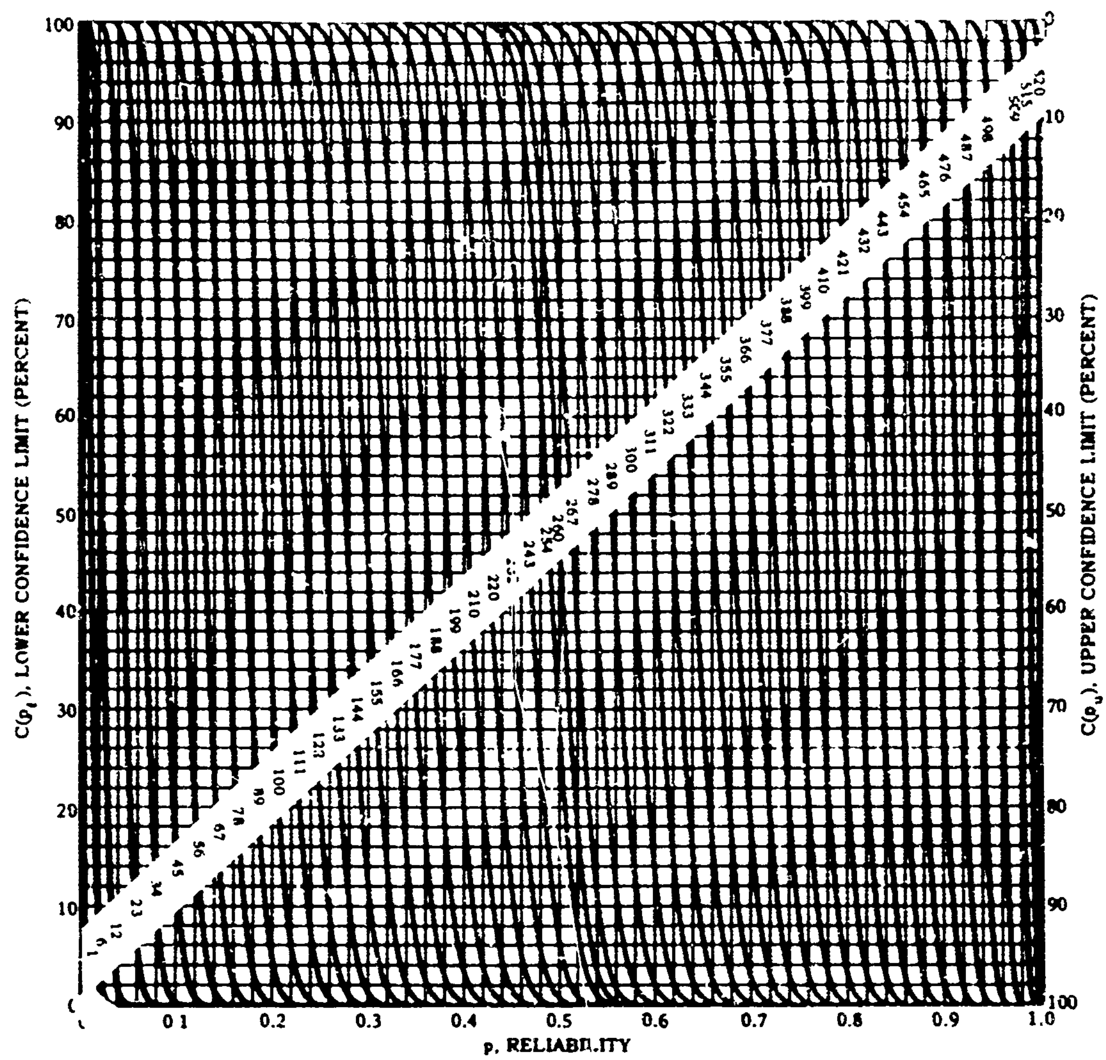
$s, (s - 1) = 1,0, 2,1, 3,2, \ldots, 500, 499$
$(s + 1), s = 1,0, 2,1, 3,2, \ldots, 500, 499$
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 140. Reliability Curves for n = 500. (s numbers on curves; for p_u, values are 1 less.)



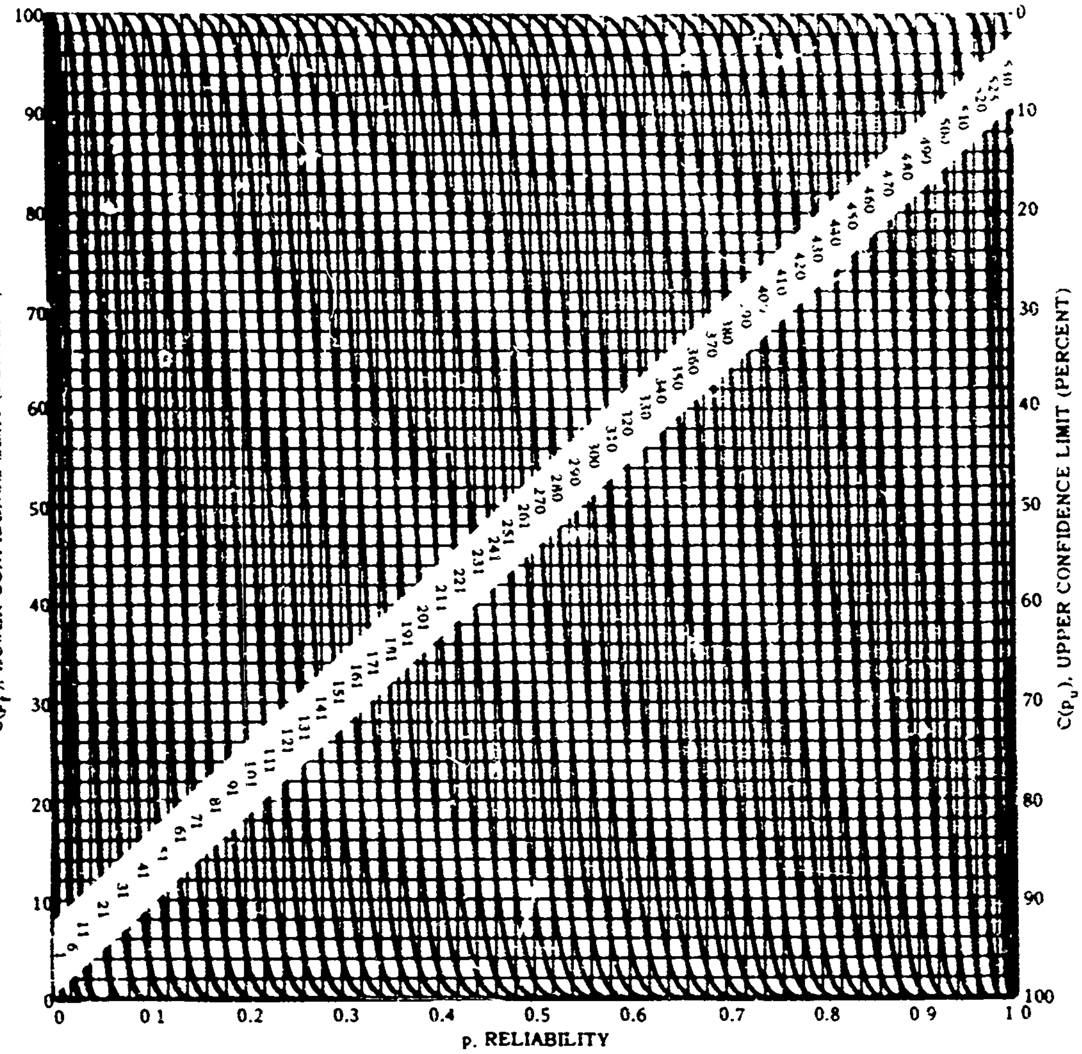
s, (s − 1) = 1,0; 2,1, 3,2, .. 510,509
(s + 1), s = 1,0; 2,1, 3,2, .. 510 509
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 141. Reliability Curves for n = 510. (s numbers on curves, for p_u, values are 1 less.)



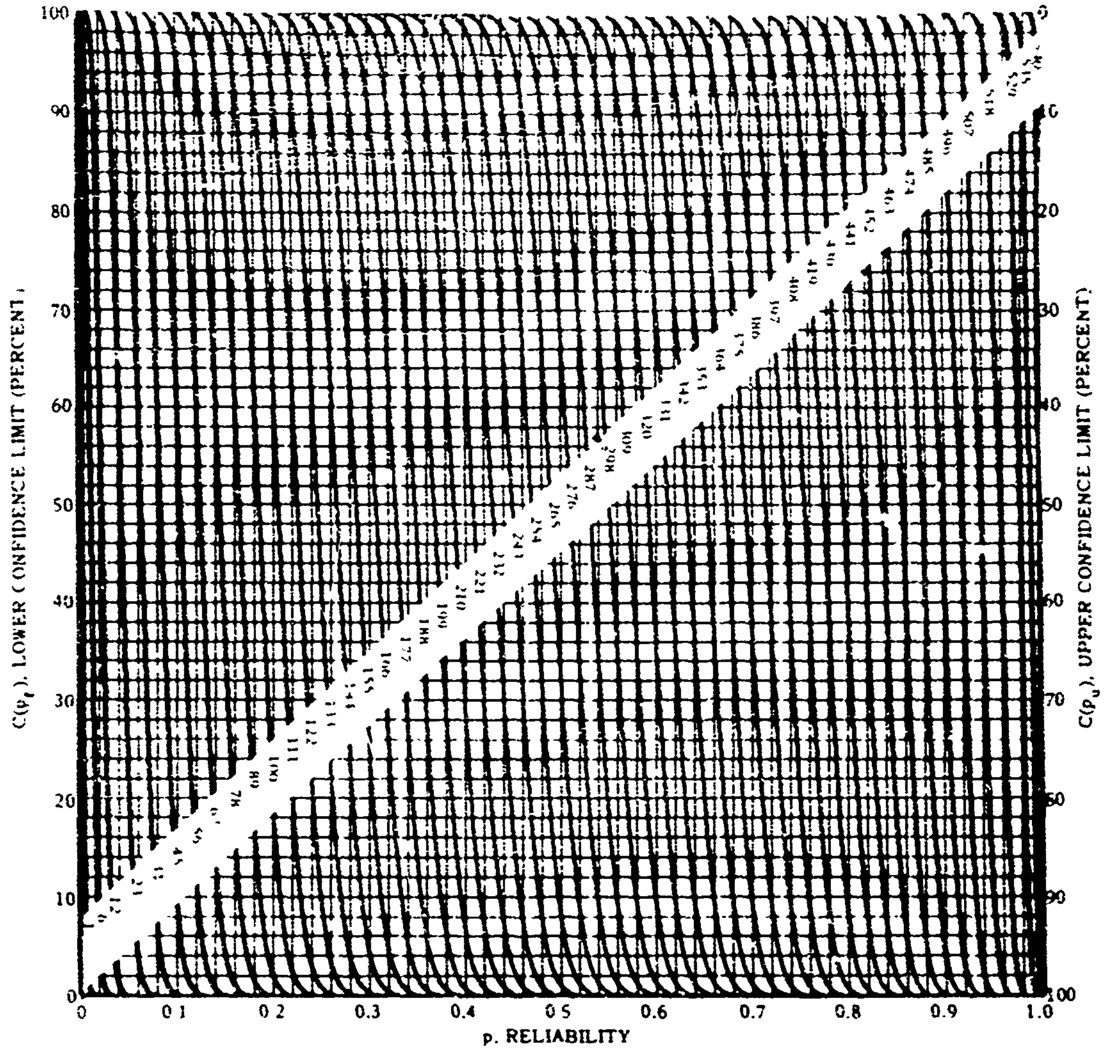
s, (s − 1) = 1,0; 2,1, 3,2; ...; 520 519
(s + 1), s = 1,0; 2,1; 3,2; ..., 520 519
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 142. Reliability Curves for n = 520. (s numbers on curves; for p_u, values are 1 less.)



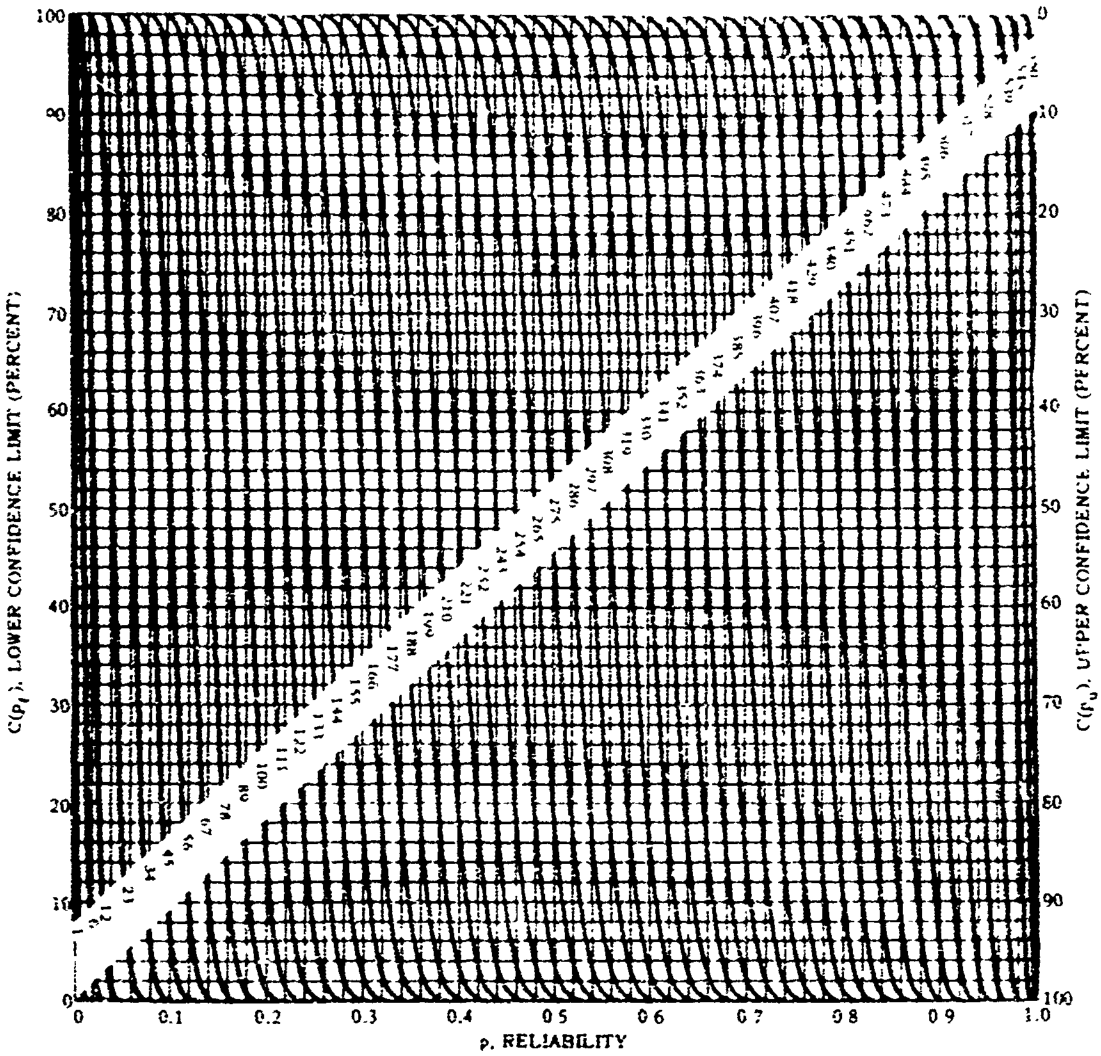
s, (s - 1) = 1,0; 2,1, 3,2; .. 530,529
(s + 1), s = 1.0; 2,1; 3,2. ...; 530 529
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 143. Reliability Curves for n = 530. (s numbers on curves; for p_u, values are 1 less.)



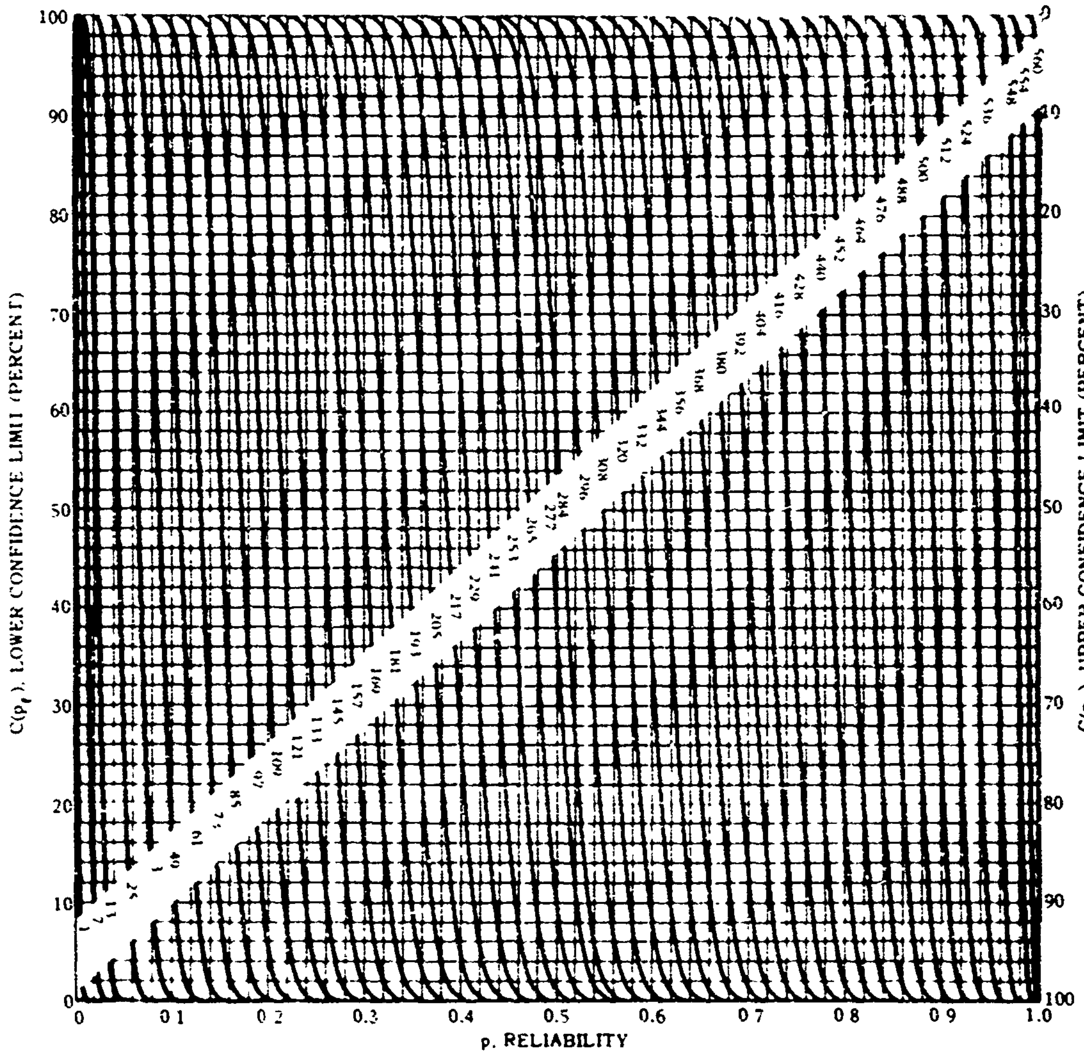
s, (s - 1) = 1,0; 2,1, 3,2, . . . 540 539
(s + 1), s = 1 0, 2,1, 3,2, . . . 540 539
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 144. Reliability Curves for n = 540. (s numbers on curves; for p_u, values are 1 less.)



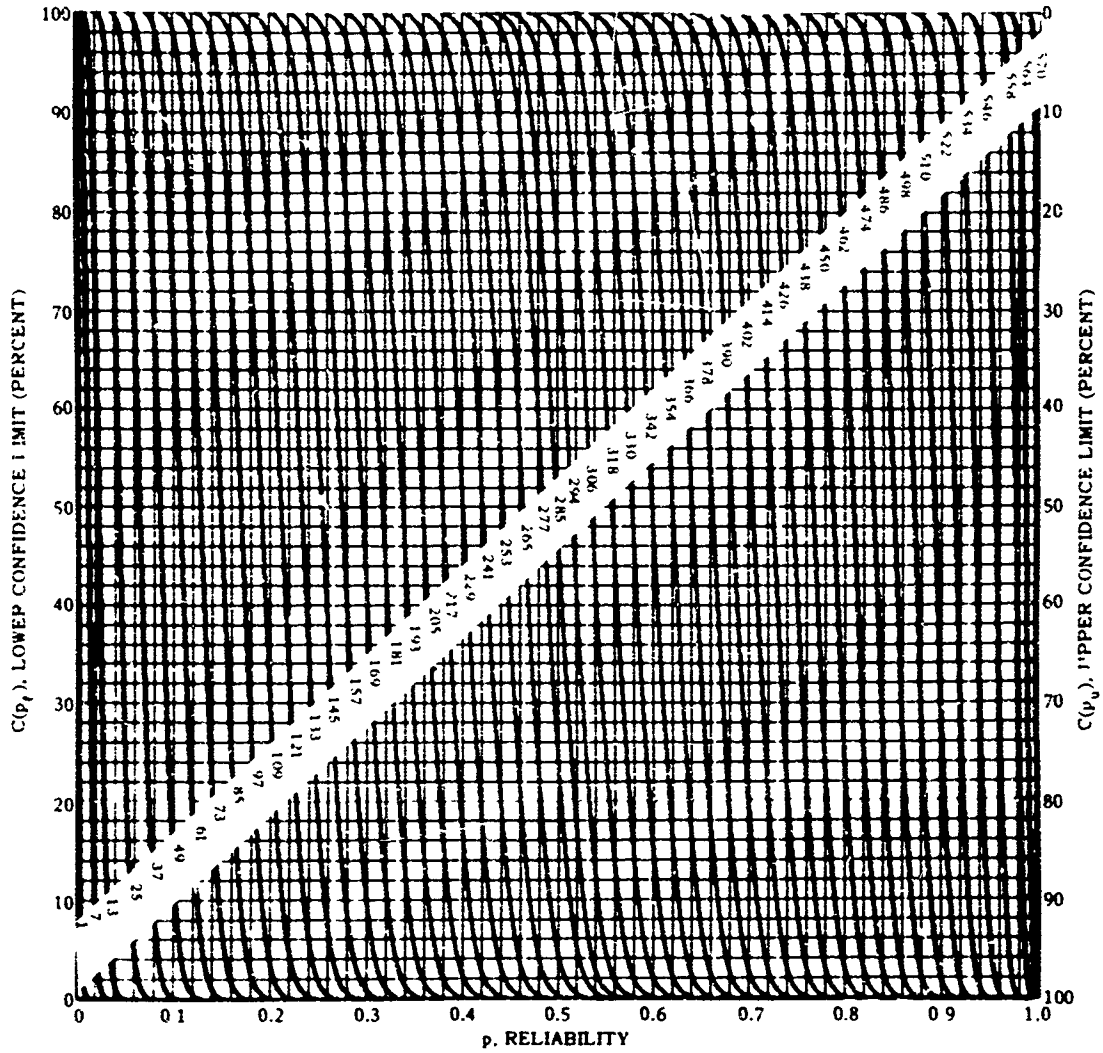
s, (s − 1) = 1,0; 2,1; 3,2, ..., 550,549
(s + 1), s = 1,0; 2,1; 3,2, ...; 550,549
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 145. Reliability Curves for n = 550. (s numbers on curves; for p_u, values are 1 less.)



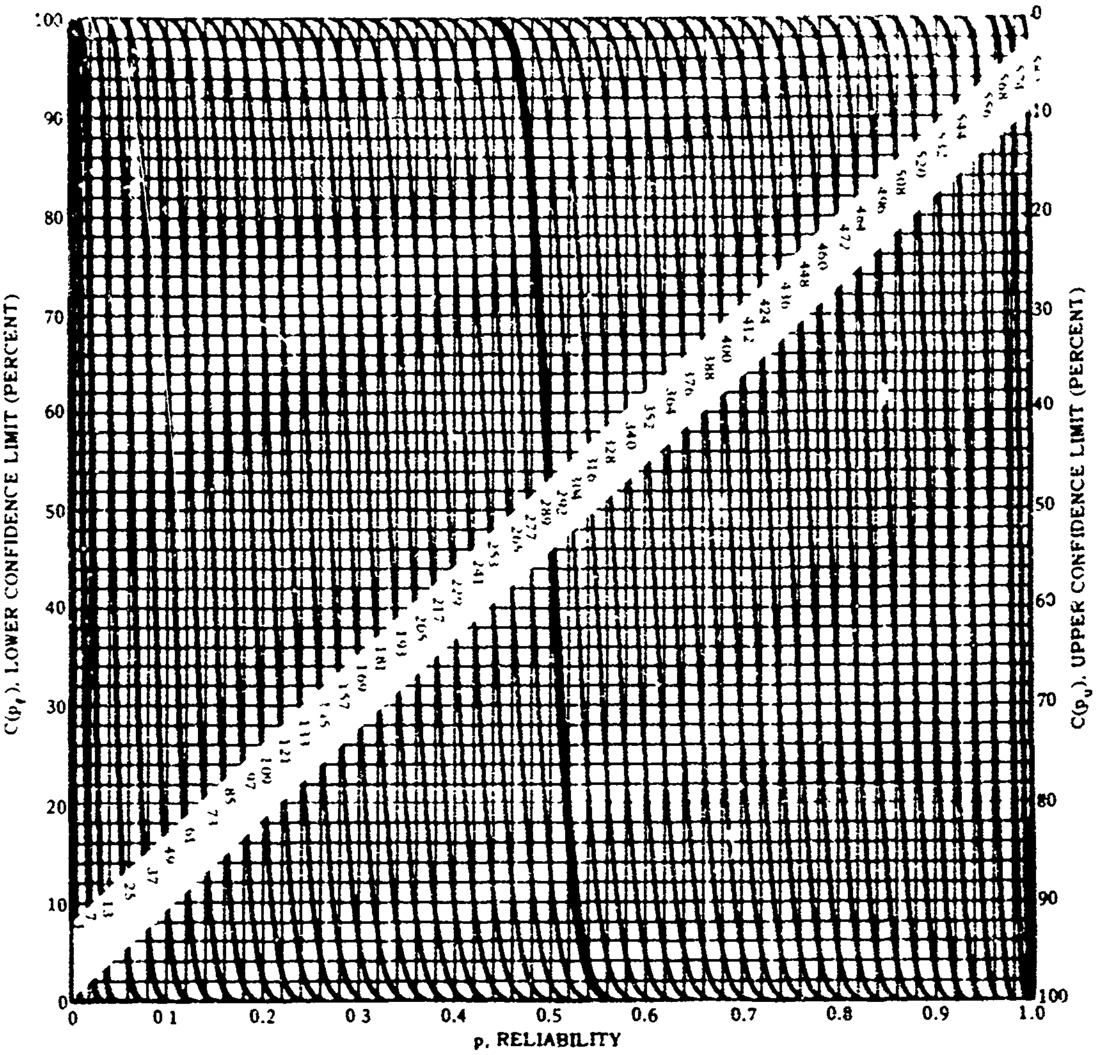
s (s - 1) = 1,0, 2,1, 3,2, .. 560 559
(s + 1) s = 1 0, 2,1, 3,2, . 560 559
C(p_ℓ) IS DETERMINED FROM s (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 146 Reliability Curves for n = 560. (s numbers on curves, for p_u, values are 1 less.)



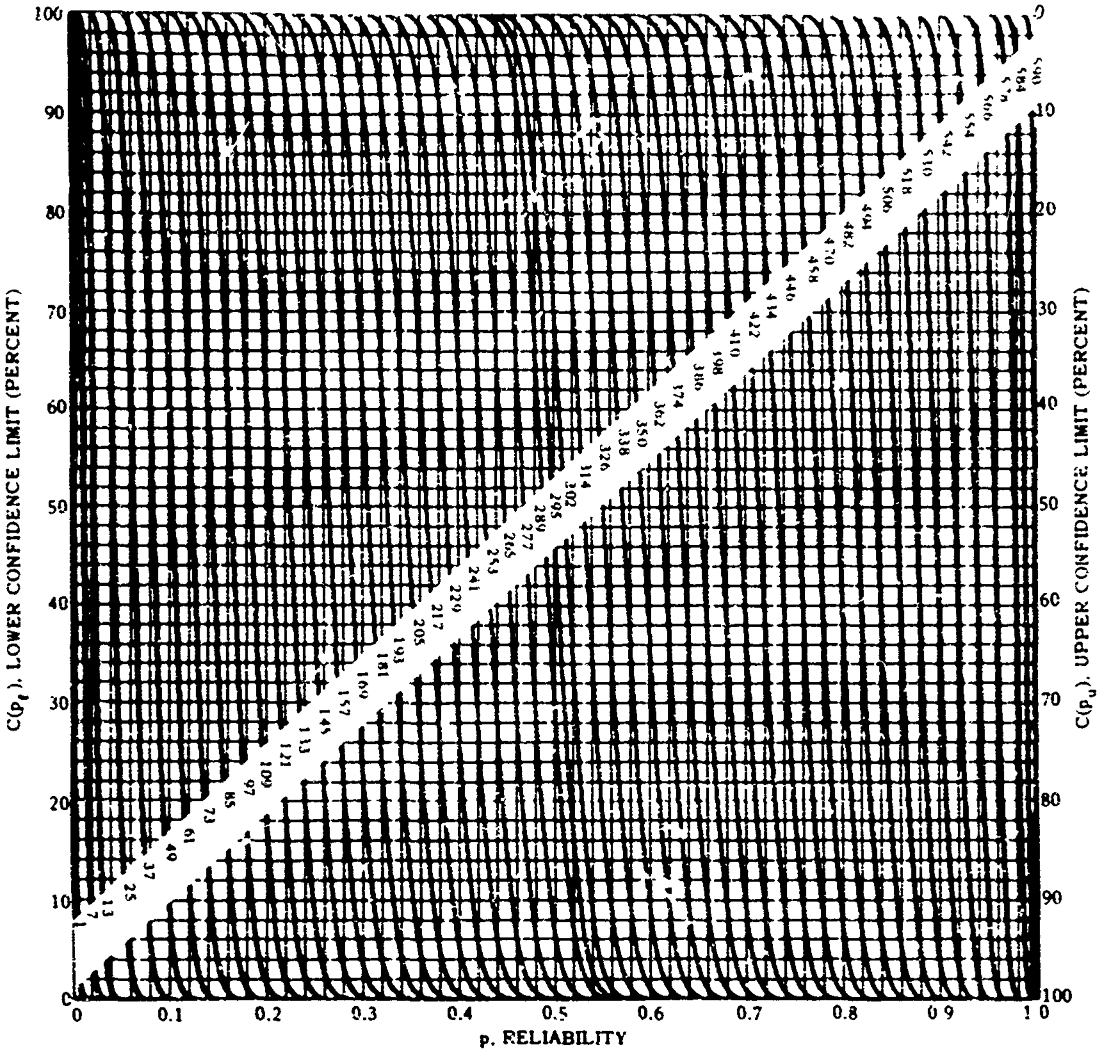
s, (s - 1) = 1,0; 2 1; 3,2, . . , 570,569
(s + 1), s = 1 0, 2,1; 3,2, .. ; 570 569
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 147. Reliability Curves for n = 570. (s numbers on curves; for p_u, values are 1 less.)



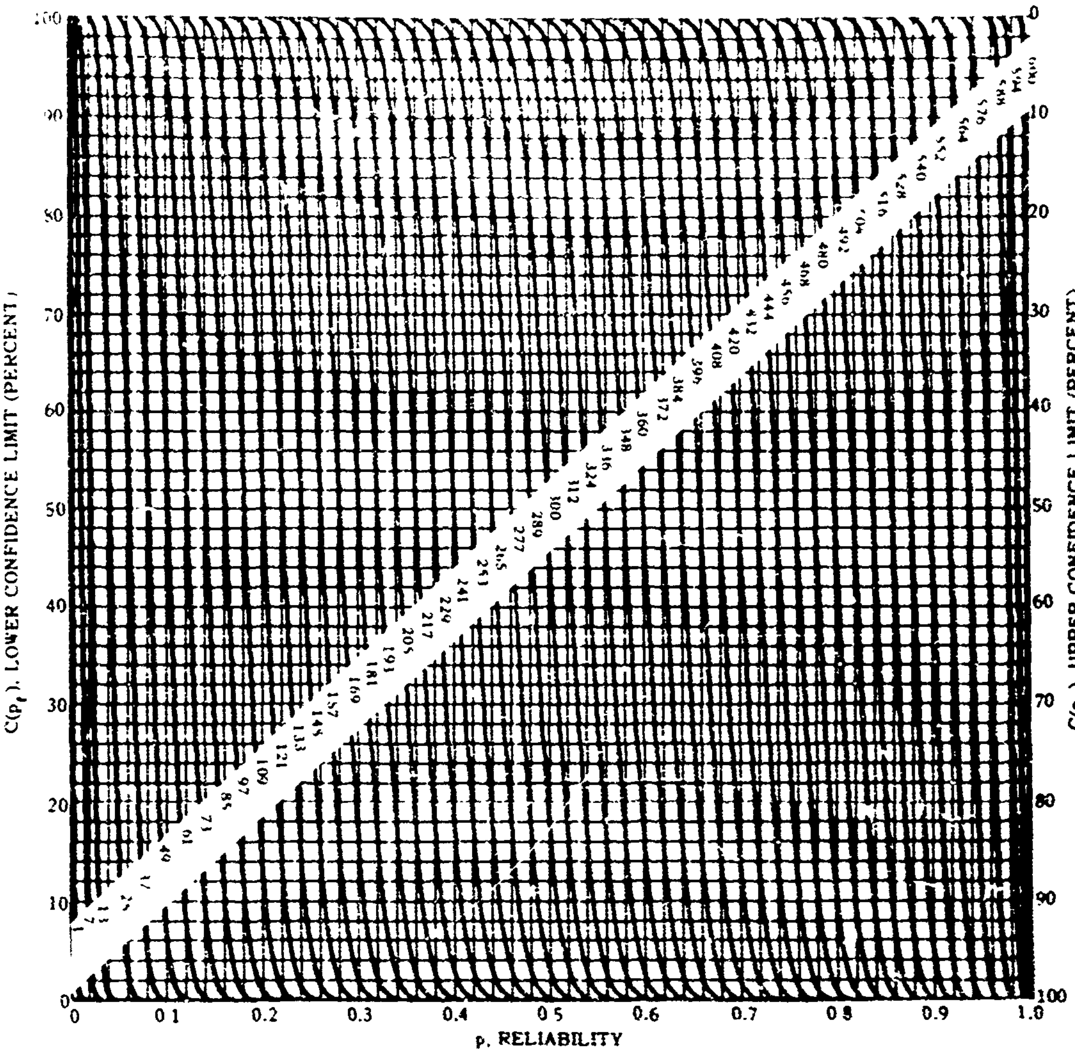
s, (s - 1) = 1,0; 2,1; 3,2; ...; 580,579
(s + 1), s = 1 0; 2,1; 3,2, ..., 580 579
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 148. Reliability Curves for n = 580. (s numbers on curves; for p_u, values are 1 less.)



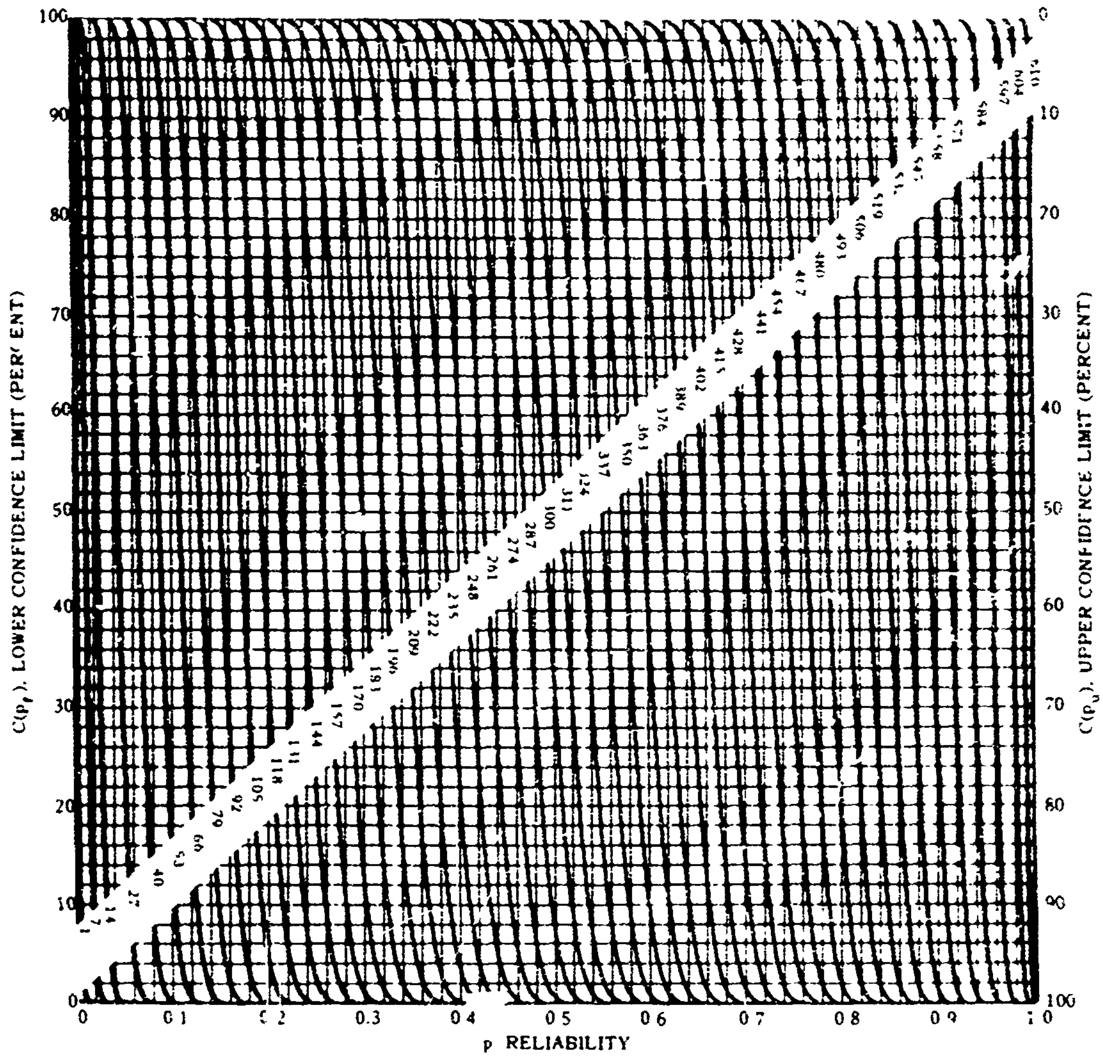
s, (s - 1) = 1,0; 2,1, 3,2, ..., 590 589
(s + 1), s = 1,0; 2,1; 3,2, ..., 590 589
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 149. Reliability Curves for n = 590. (s numbers on curves; for p_u, values are 1 less.)



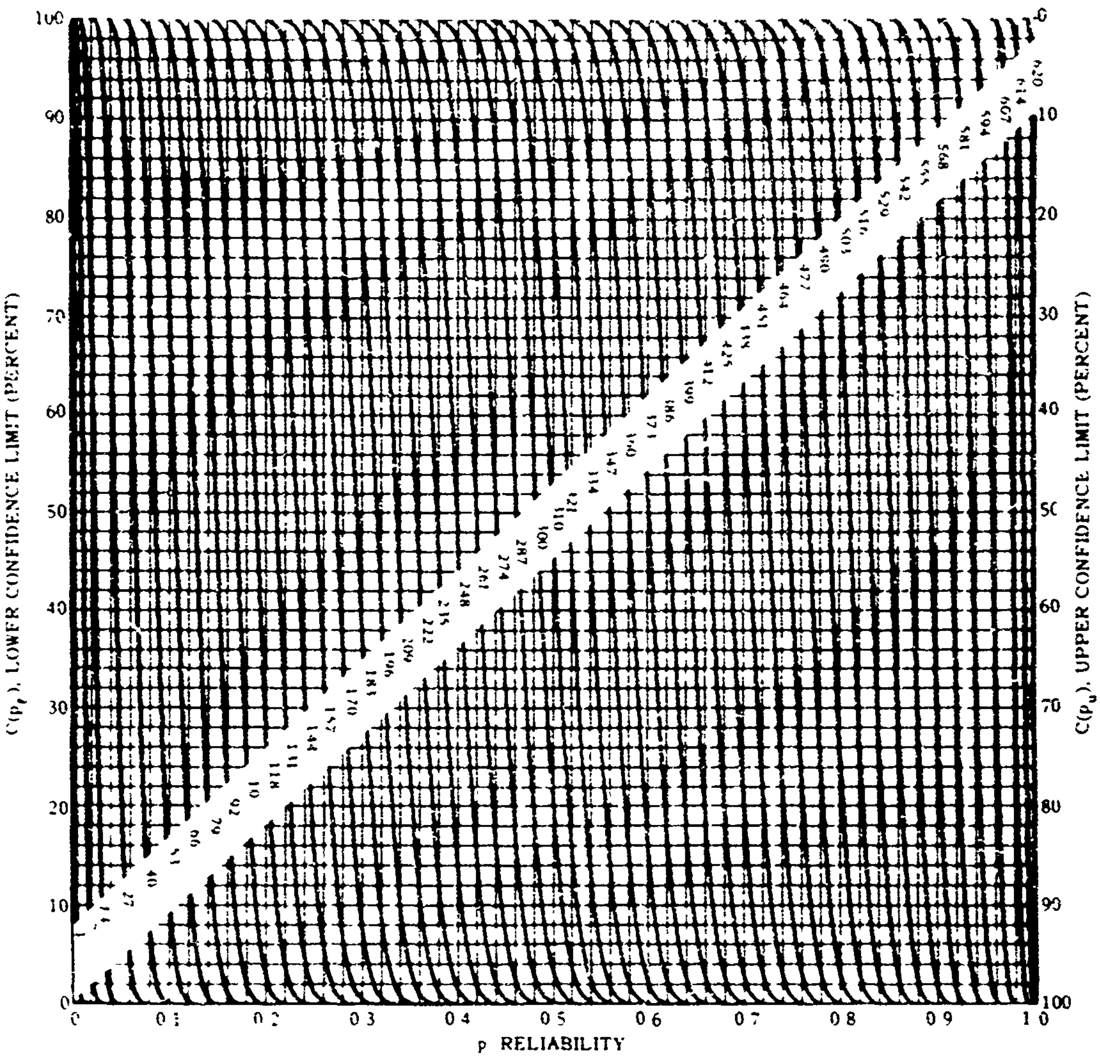
s, (s − 1) = 1,0; 2,1, 3,2, . 600,599
(s + 1), s = 1 0, 2,1, 3,2, . . ; 600,599
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 150. Reliability Curves for n = 600. (s numbers on curves; for p_u, values are 1 less.)



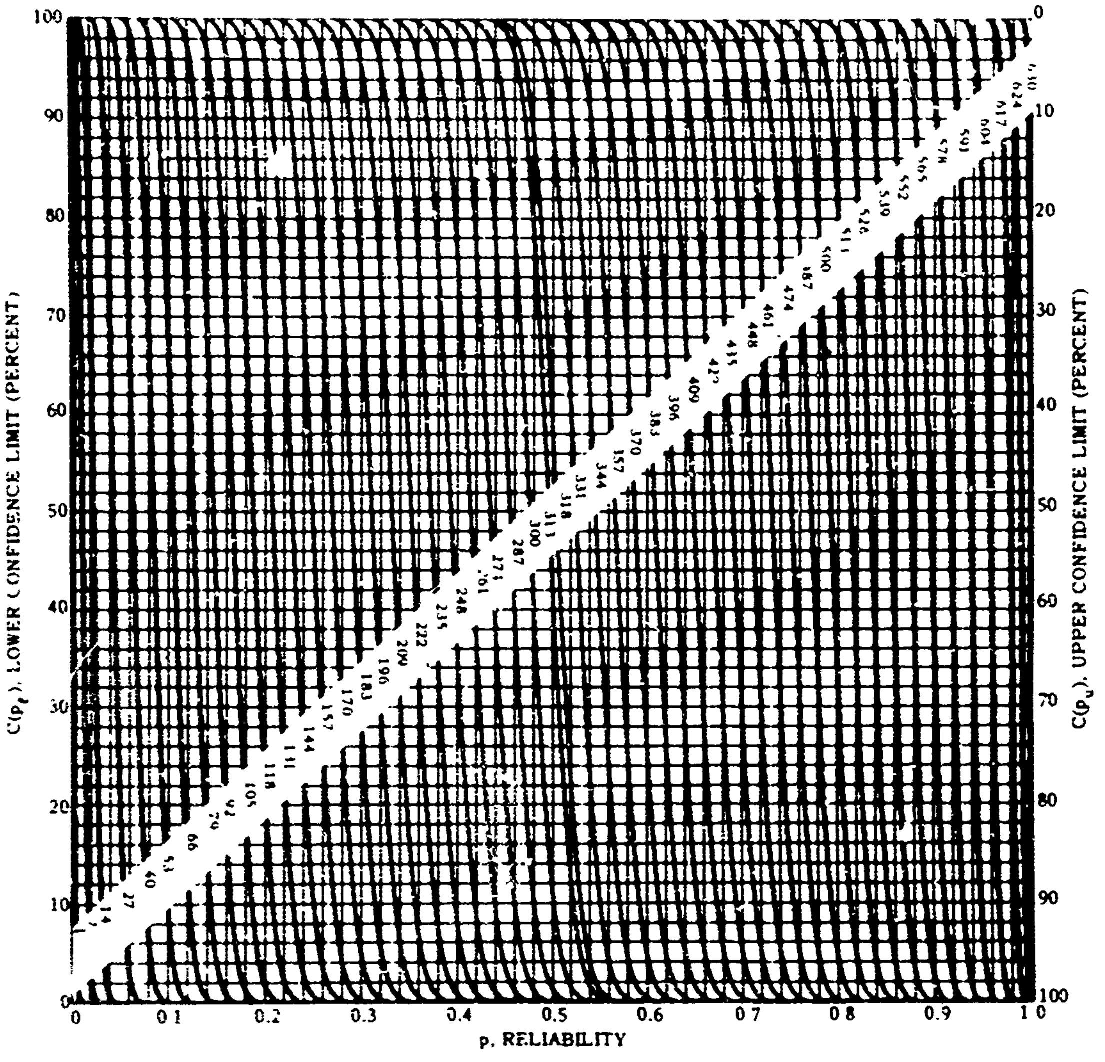
s (s - 1) = 1 0, 2,1, 3,2, ... 610 609
(s + 1) s = 1 0, 2,1, 3,2 ... 610 609
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 151. Reliability Curves for $n = 610$. (s numbers on curves, for p_u, values are 1 less.)



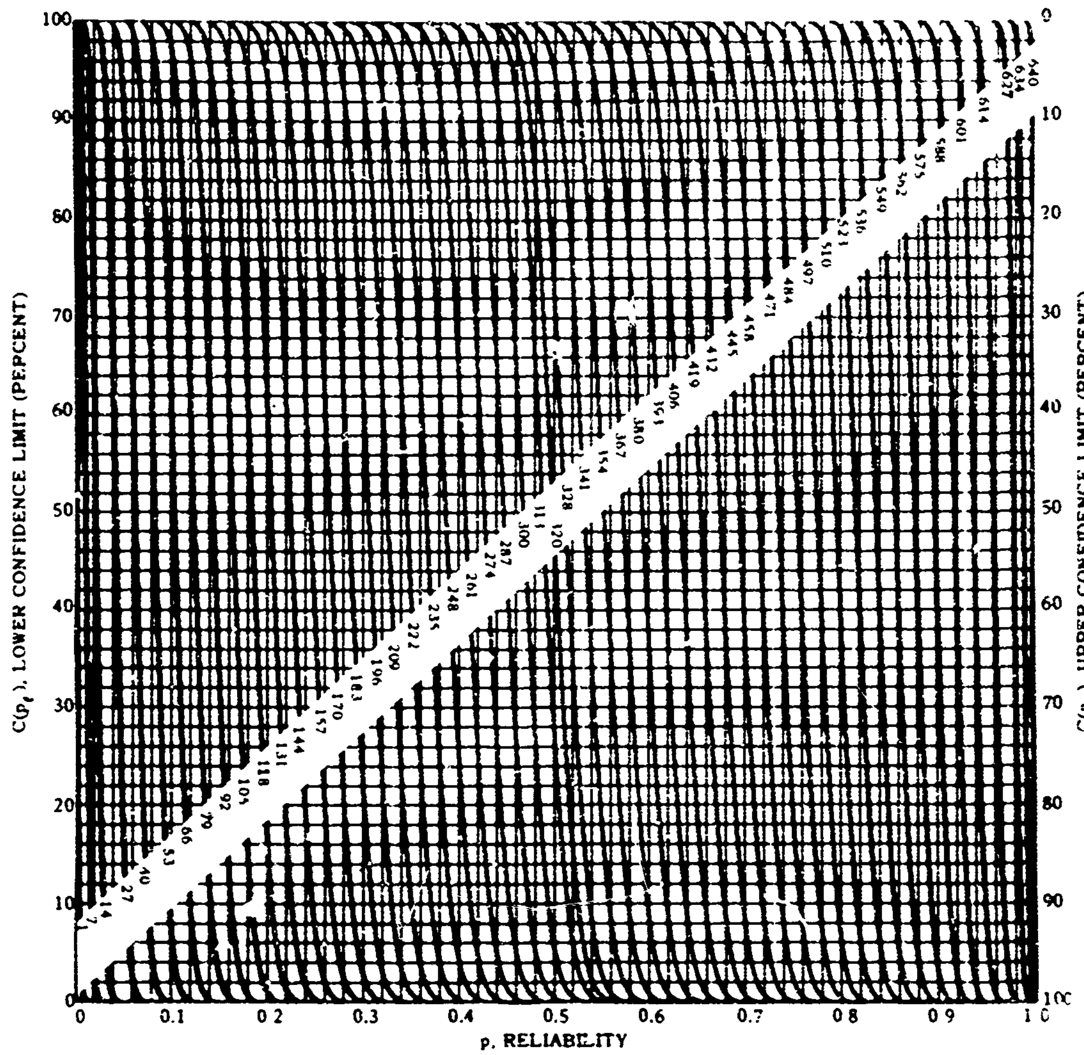
s (s − 1) = 1 0, 2 1, 3 2, . . . 620 619
(s + 1) s = 1 0, 2 1, 3 2, . . . 620 619
C(p_ℓ) IS DETERMINED FROM s (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 152 Reliability Curves for n = 620. (s numbers on curves, for p_u values are 1 less.)



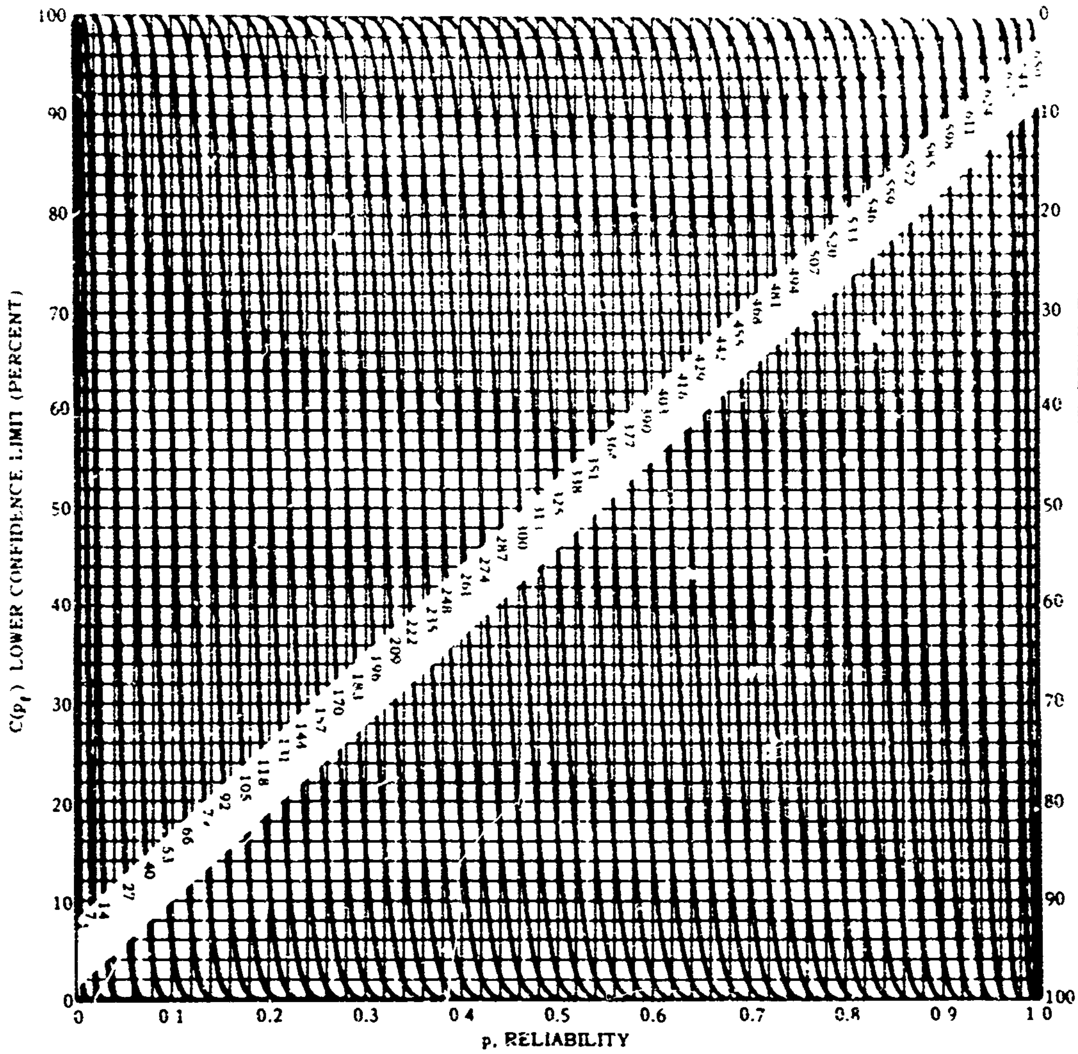
s (s − 1) = 1,0, 2,1, 3,2, . 630,629
(s + 1) s = 1 0, 2,1, 3,2, . 630 629
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 153. Reliability Curves for n = 630. (s numbers on curves, for p_u, values are 1 less.)



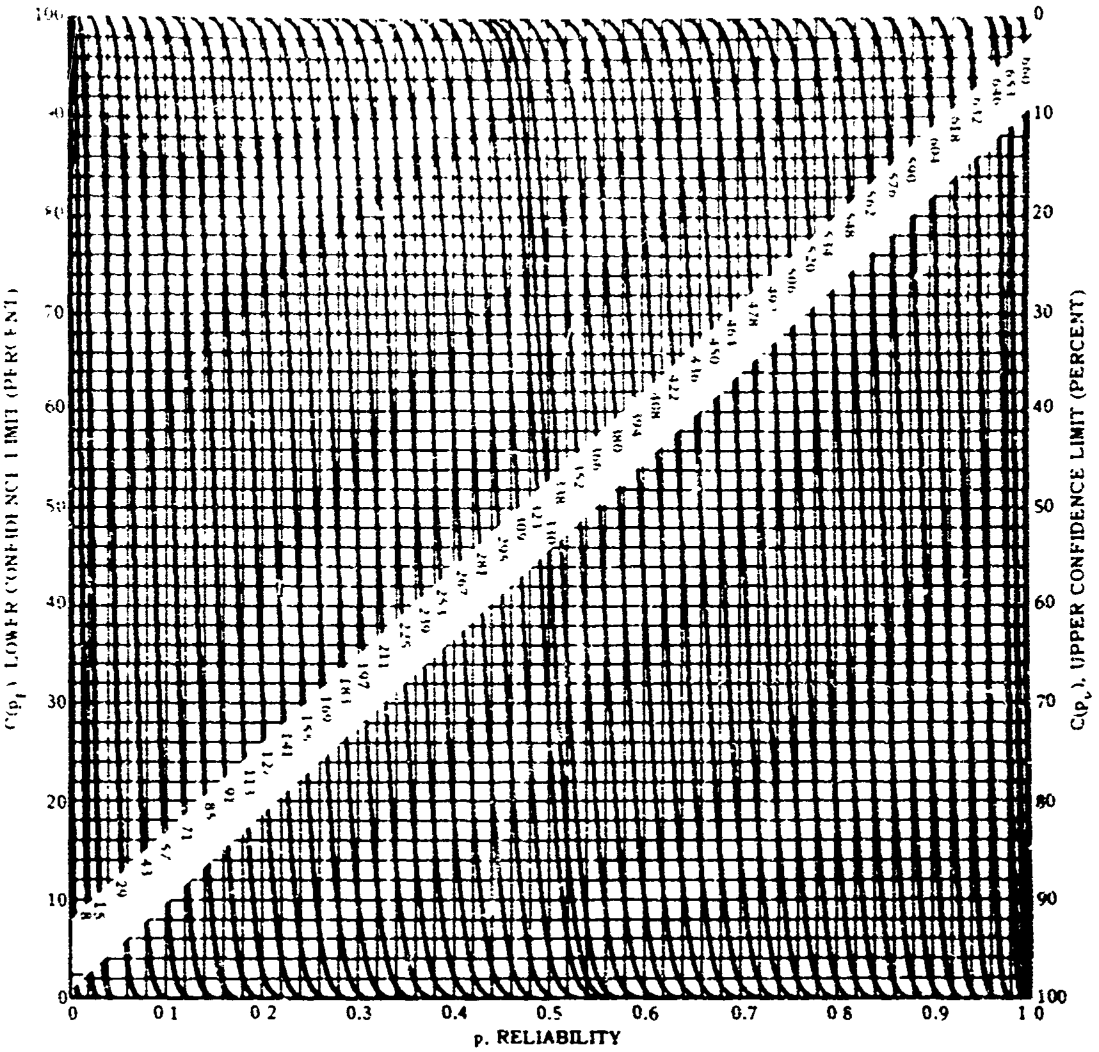
s, (s - 1) = 1,0; 2,1, 3,2, . 640 639
(s + 1), s = 1.0, 2,1, 3,2, .. 640 639
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 154. Reliability Curves for n = 640. (s numbers on curves, for p_u, values are 1 less.)



s, (s - 1) = 1 0; 2,1; 3,2, . 650,649
(s + 1), s = 1 0, 2,1, 3,2, . 650 649
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 155. Reliability Curves for n = 650. (s numbers on curves; for p_u, values are 1 less.)



s (s - 1) = 1,0; 2,1; 3,2, .. 660,659

(s + 1), s = 1 0, 2,1, 3,2, , 660 659

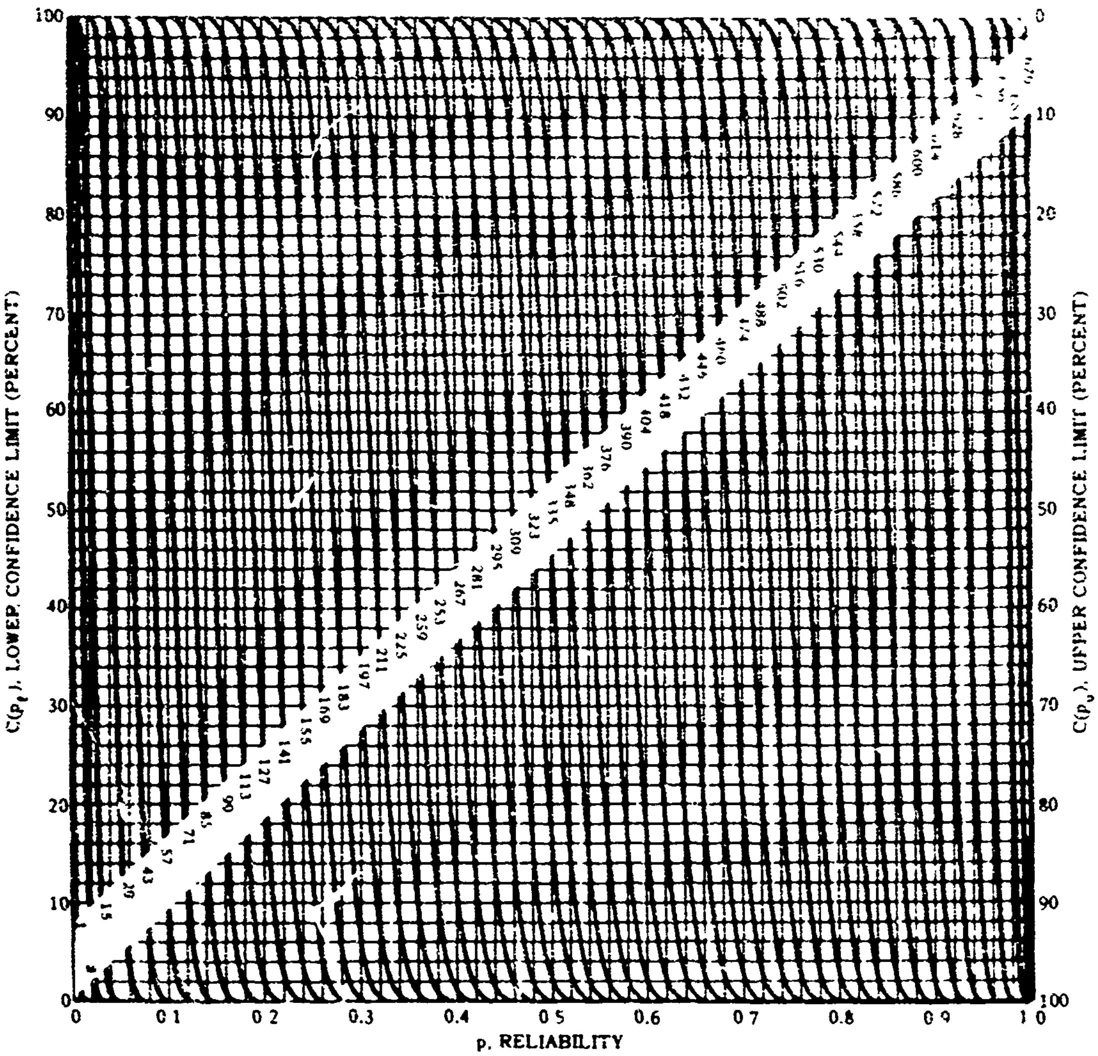
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

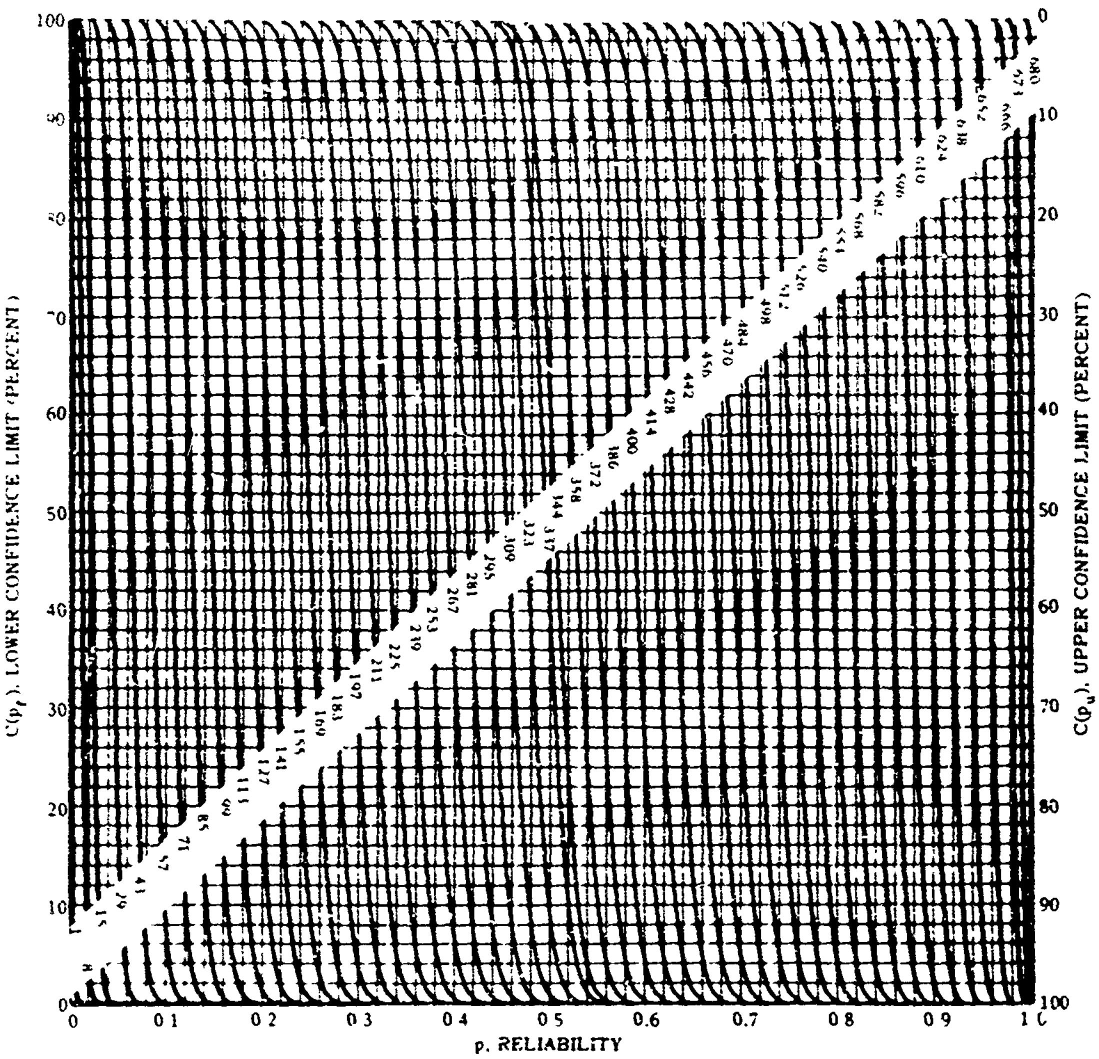
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 156. Reliability Curves for n = 660. (s numbers on curves; for p_u, values are 1 less.)



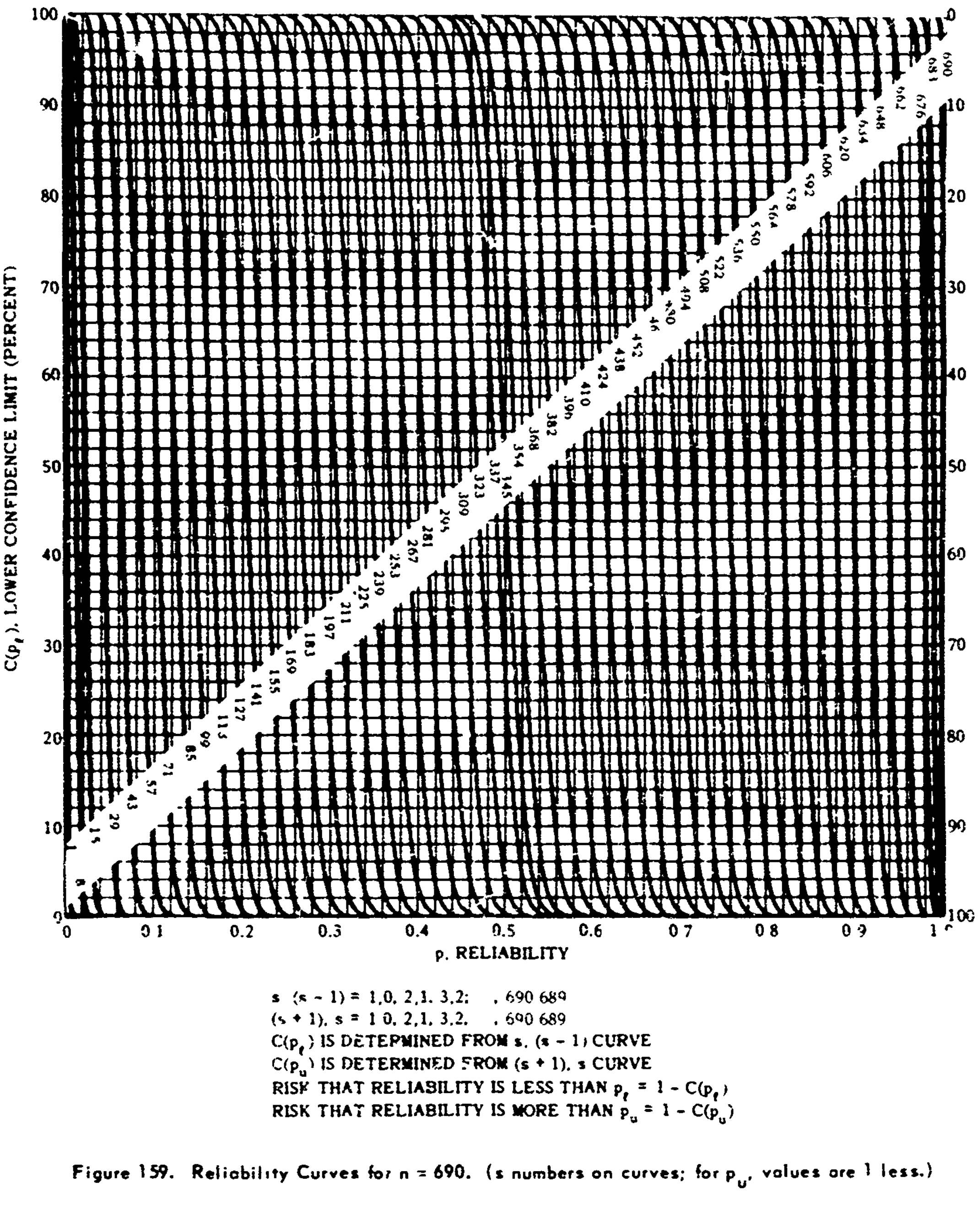
s (s - 1) = 1,0; 2,1, 3,2, ..., 670 669
(s + 1), s = 1 0, 2,1 3,2, ..., 670 669
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 157. Reliability Curves for n = 670. (s numbers on curves, for p_u, values are 1 less.)



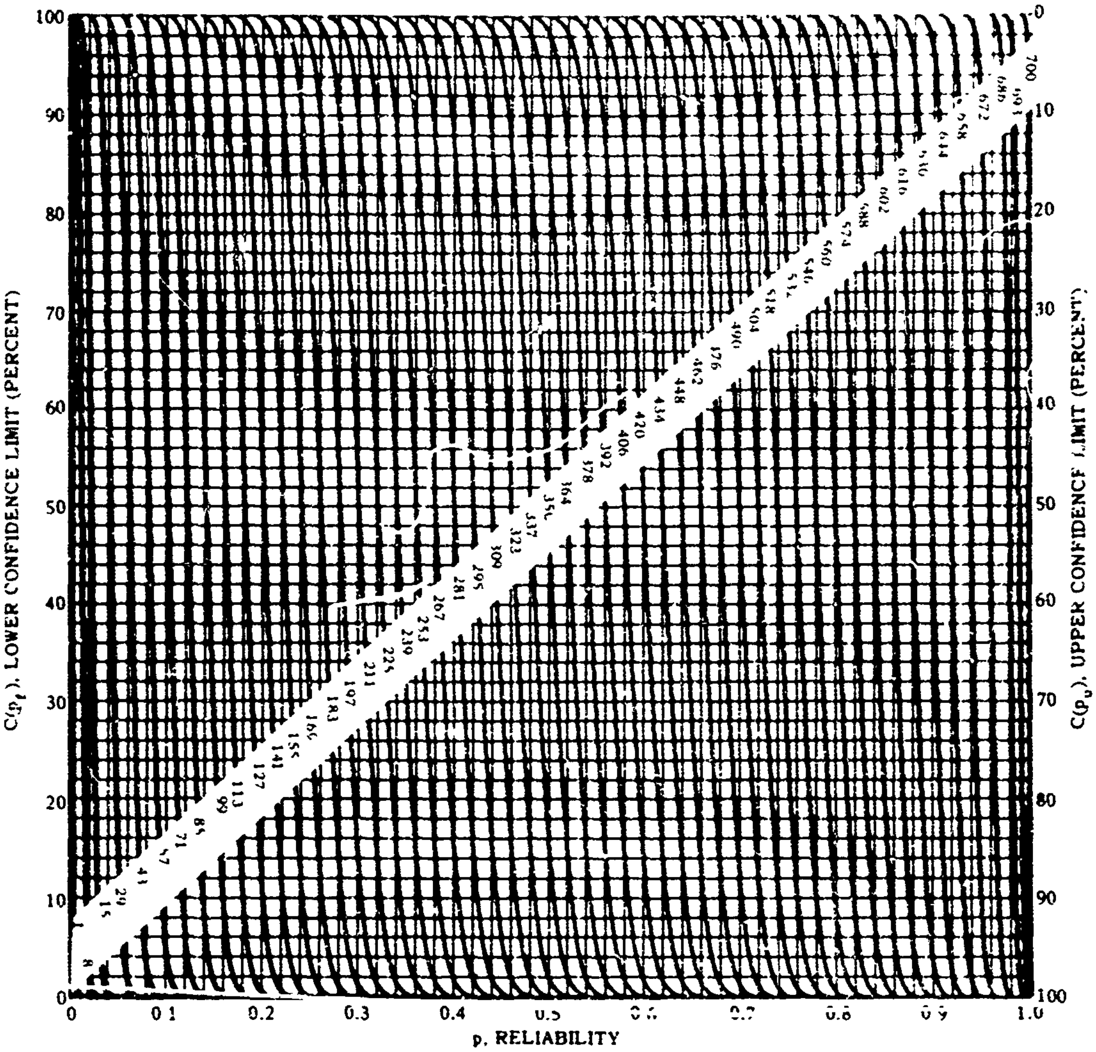
s (s - 1) = 1,0; 2,1, 3,2, . 680 679
(s + 1) s = 1 0, 2,1, 3,2, . 680 679
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 158. Reliability Curves for n = 680. (s numbers on curves; for p_u, values are 1 less.)



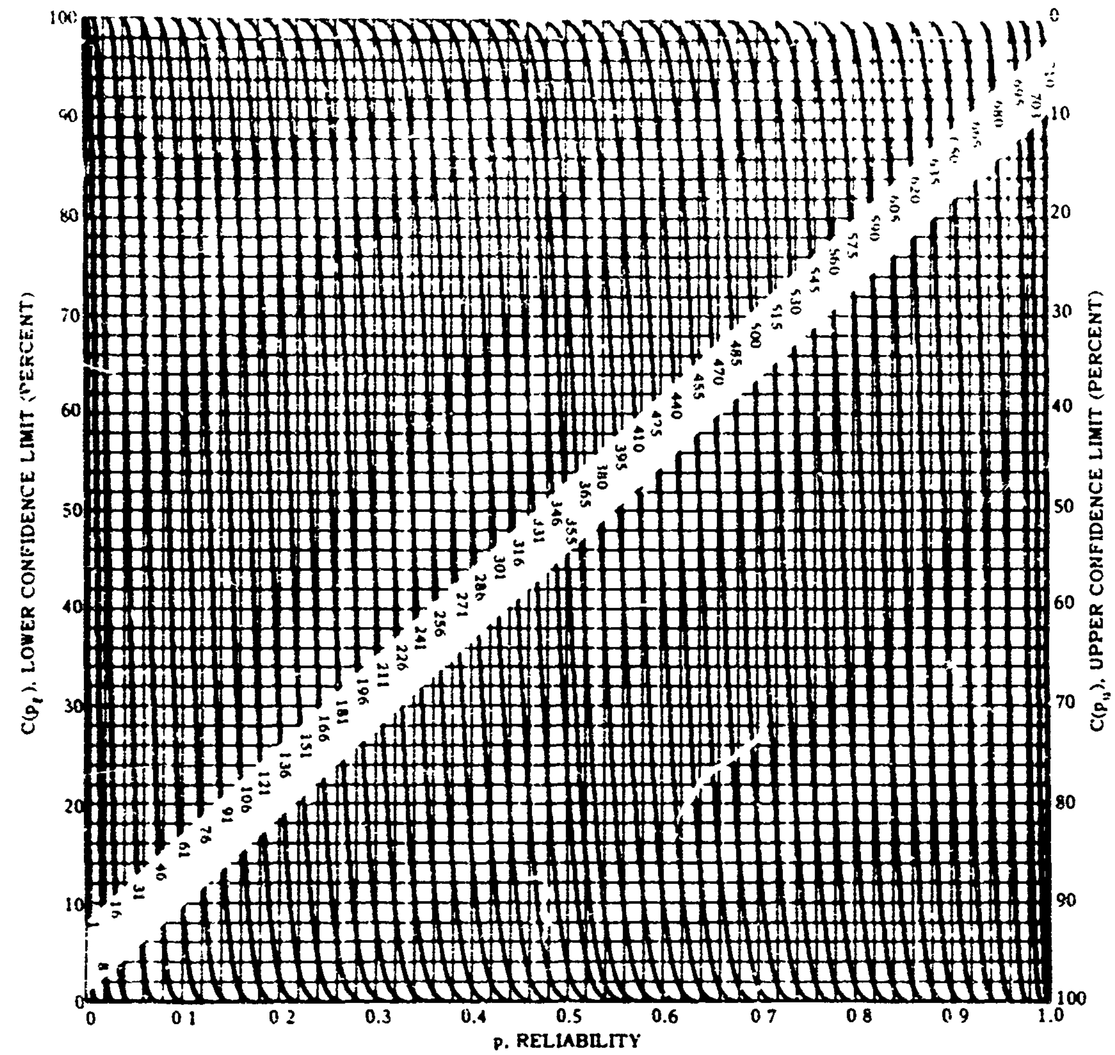
s, (s - 1) = 1,0, 2,1, 3,2; . . . , 690 689
(s + 1), s = 1 0, 2,1, 3,2, . . . , 690 689
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 159. Reliability Curves for n = 690. (s numbers on curves; for p_u, values are 1 less.)



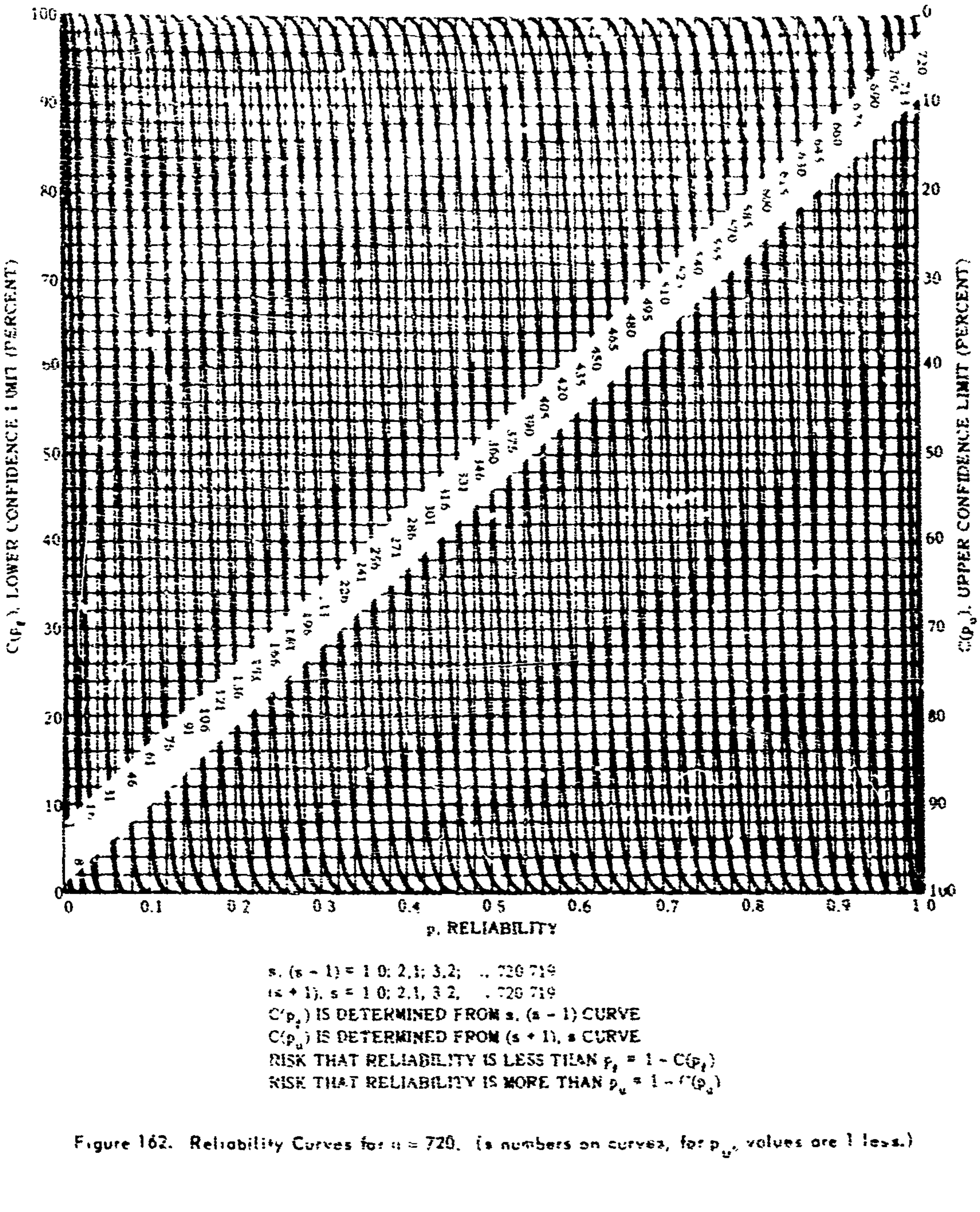
s, (s - 1) = 1,0; 2,1, 3,2, . . ., 700,699
(s + 1), s = 1 0, 2,1, 3,2, . ., 700 699
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 160. Reliability Curves for n = 700. (s numbers on curves; for p_u, values are 1 less.)



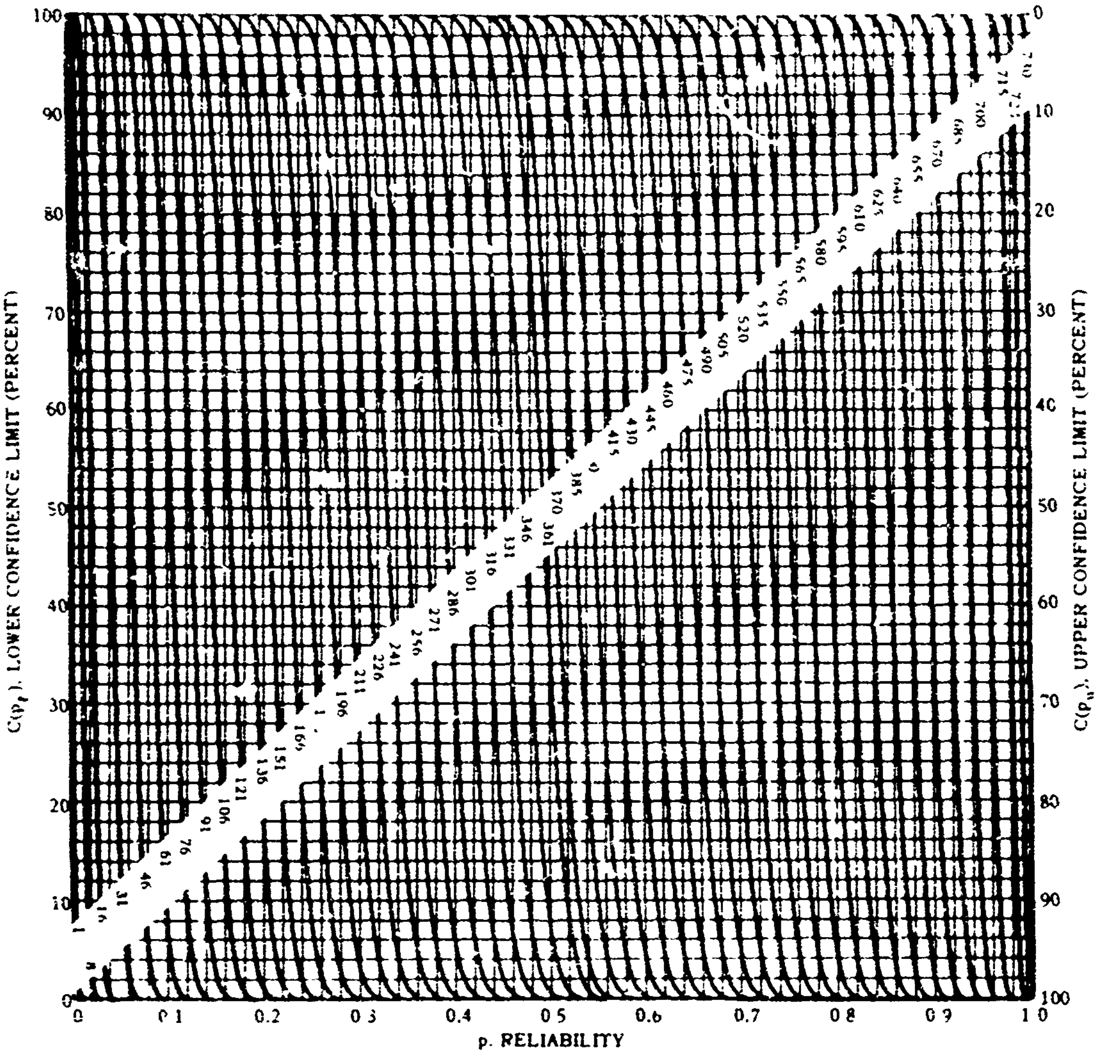
s, (s - 1) = 1,0, 2,1, 3,2, ..., 710,709
(s + 1), s = 1 0; 2,1; 3,2, .., 710 709
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 151. Reliability Curves for n = 710. (s numbers on curves; for p_u, values are 1 less.)



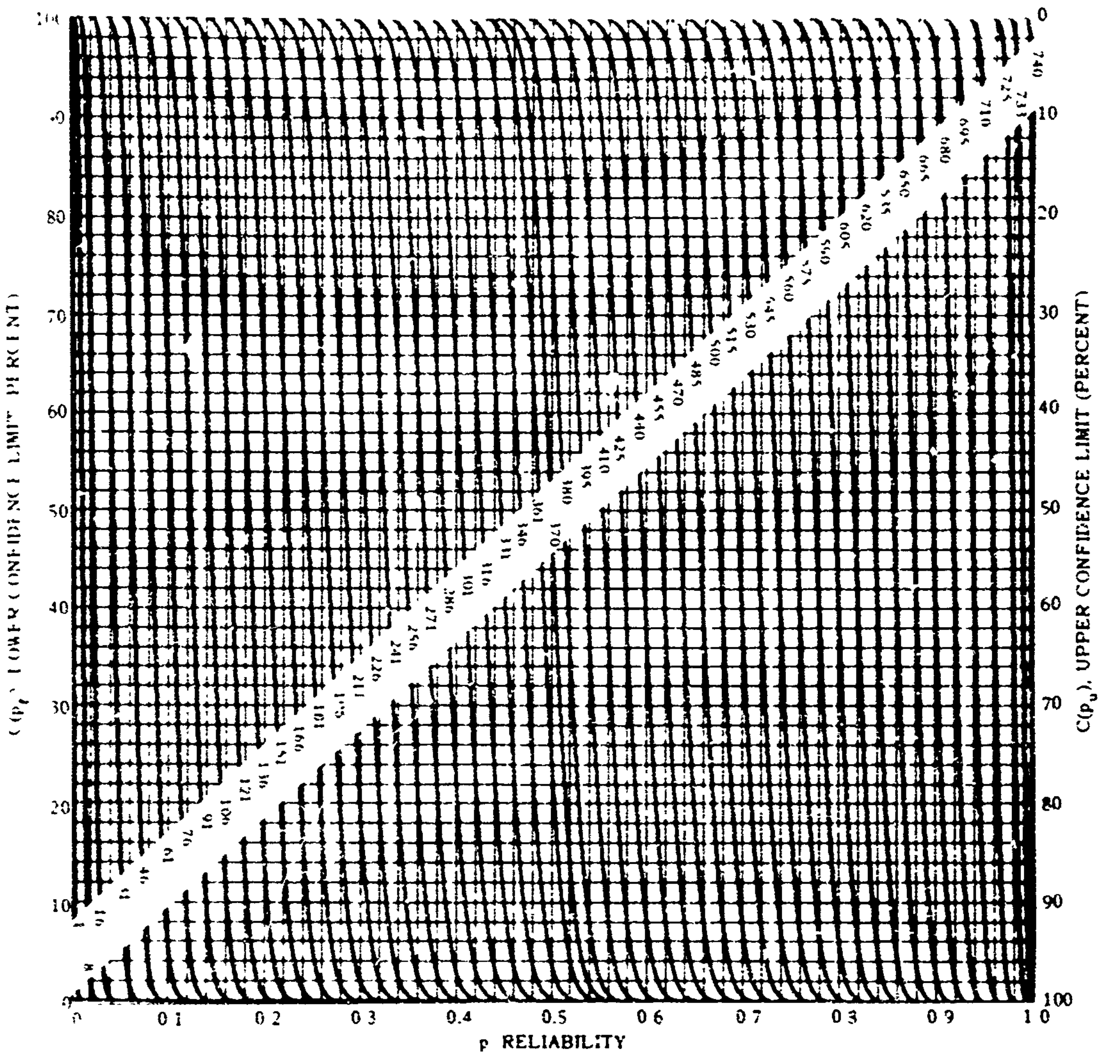
s, (s − 1) = 1 0; 2,1; 3,2; ... 720 719
(s + 1), s = 1 0; 2,1, 3 2, ... 720 719
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 162. Reliability Curves for n = 720. (s numbers on curves, for p_u, values are 1 less.)



s (s - 1) = 1,0, 2,1, 3,2, . . . 730 729
(s + 1) s = 1 0, 2,1, 3,2 . . . 730 729
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 163. Reliability Curves for n = 730. (s numbers on curves; for p_u, values are 1 less.)



s (s - 1) = 1 0, 2 1, 3 2, ... 740 739

(s + 1) s = 1 0, 2 1, 3 2, ... 740 739

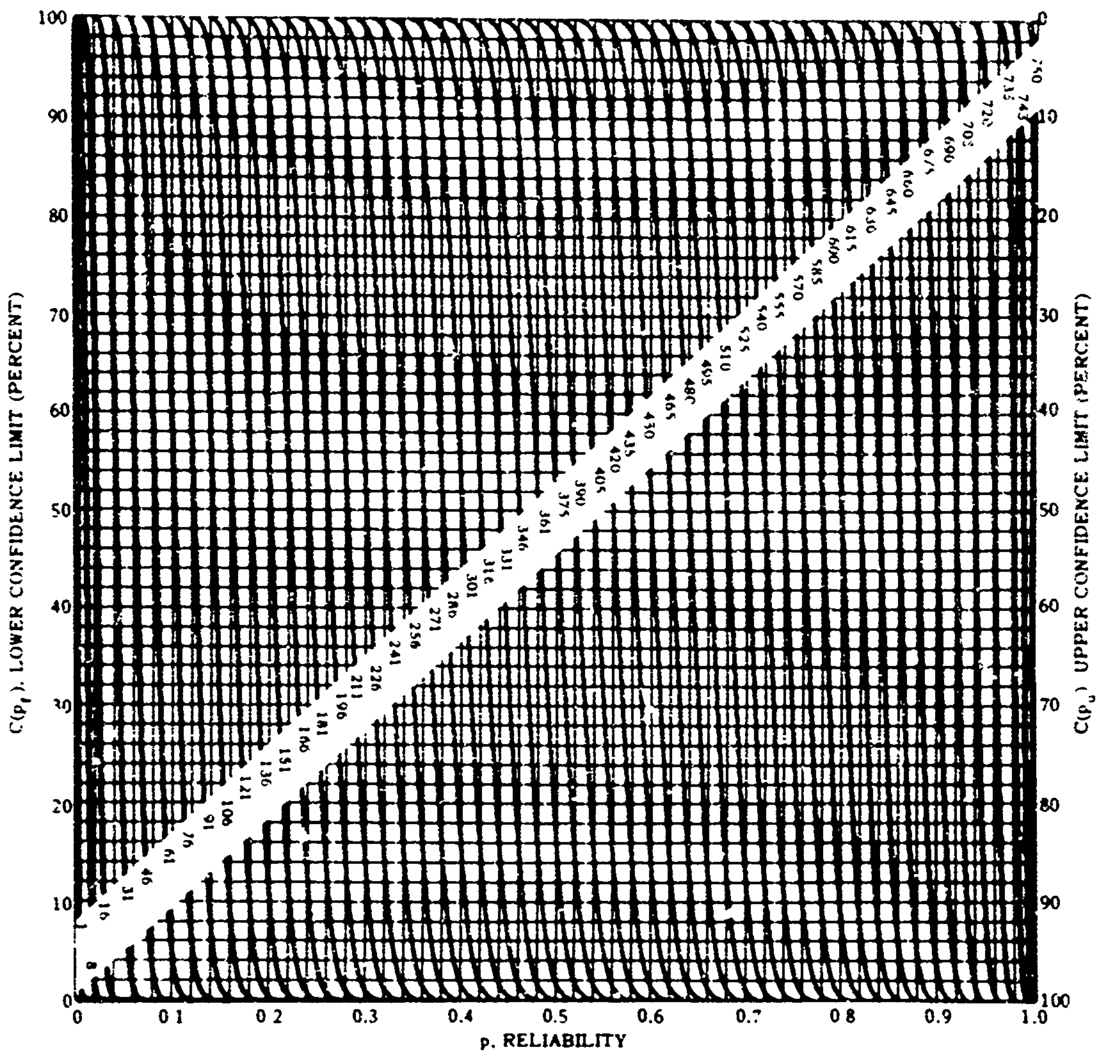
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE

$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE

RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$

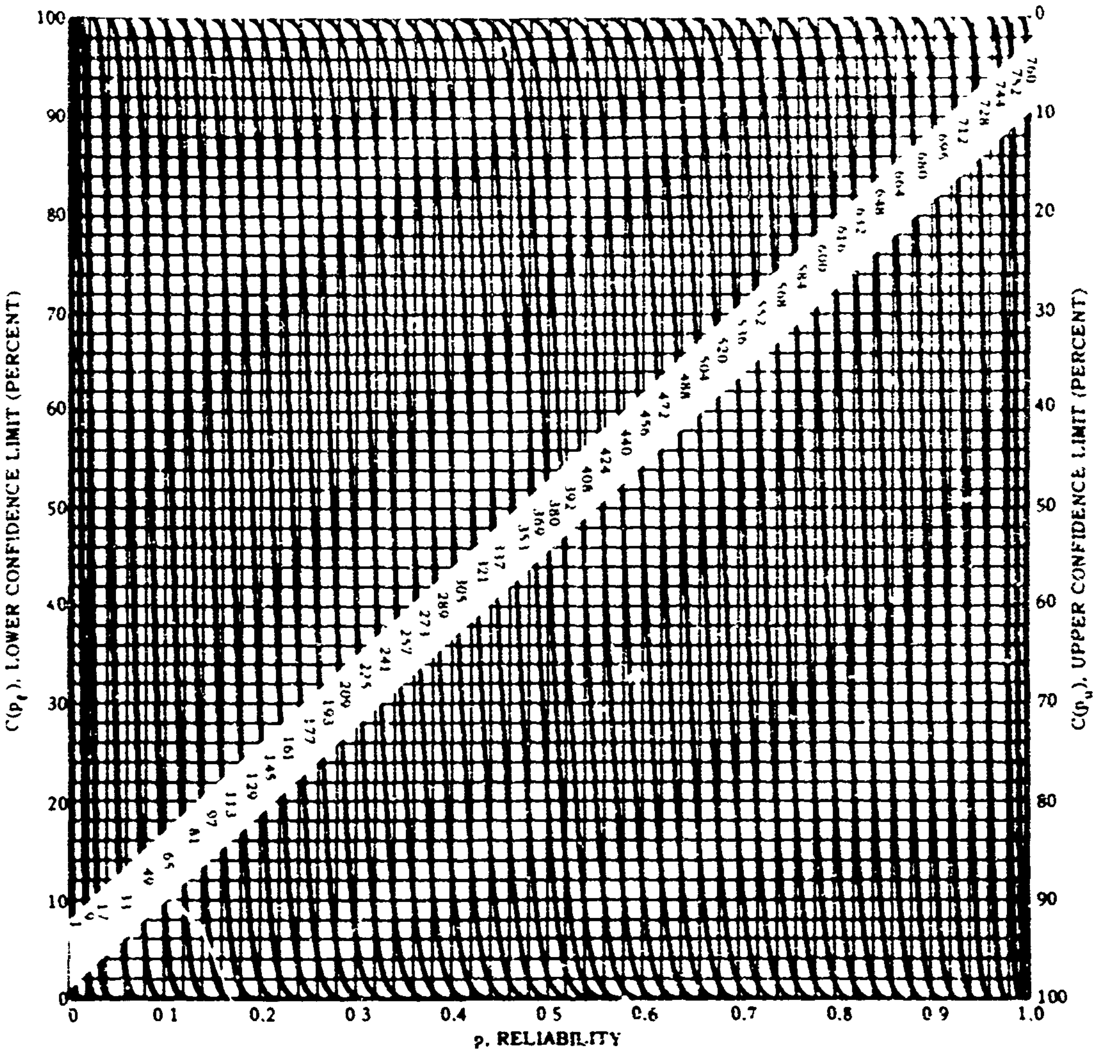
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 164. Reliability Curves for n = 740. (s numbers on curves; for p_u, values are 1 less.)



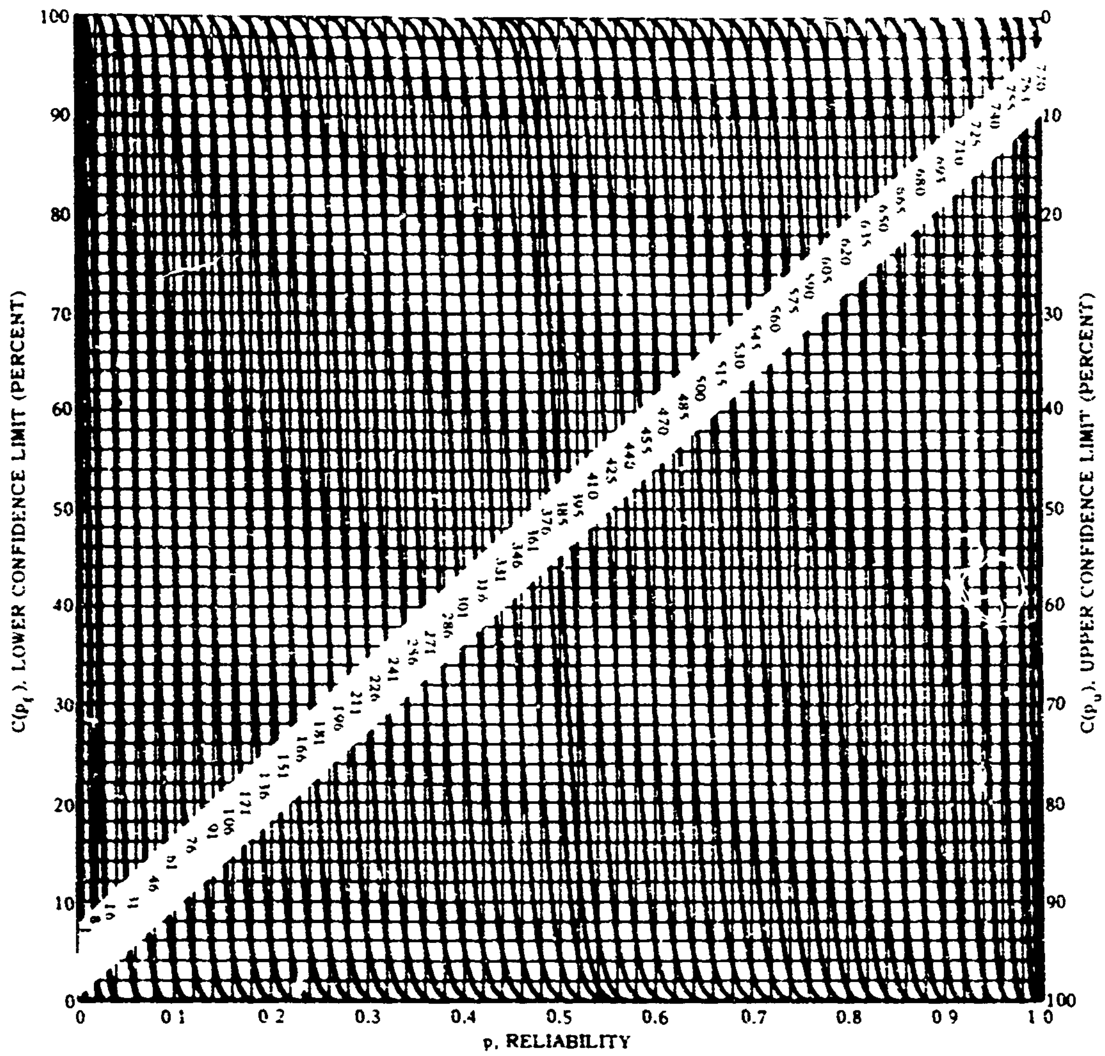
$s, (s-1) = 1,0,\ 2,1,\ 3,2,\ \ldots\ 750\ 749$
$(s+1), s = 1\ 0,\ 2,1,\ 3\ 2,\ \ldots\ 750\ 749$
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 165. Reliability Curves for n = 750. (s numbers on curves; for p_u, values are 1 less.)



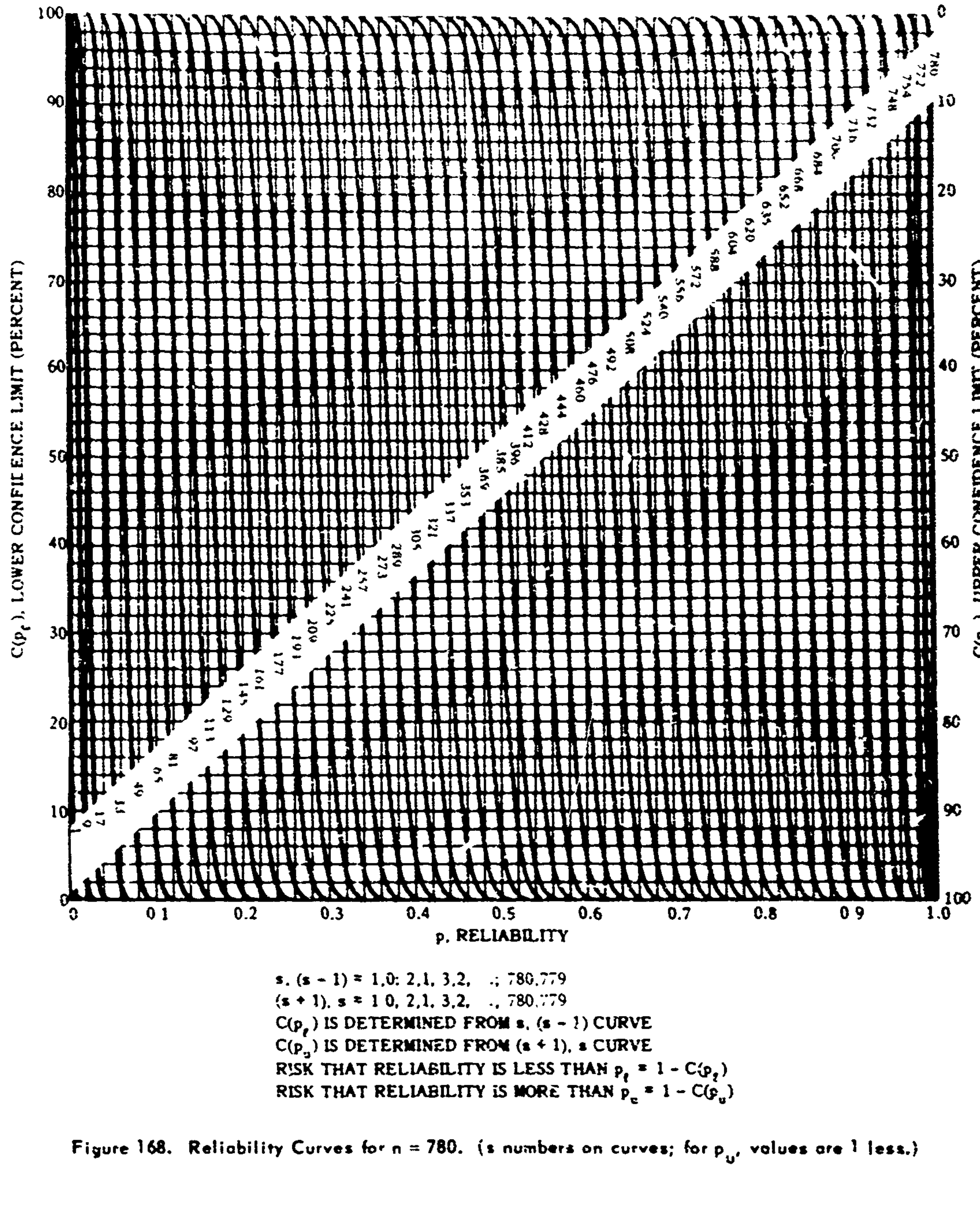
$s, (s-1) = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 760,759$
$(s+1), s = 1,0;\ 2,1;\ 3,2;\ \ldots,\ 760,759$
$C(p_\ell)$ IS DETERMINED FROM $s, (s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 166. Reliability Curves for n = 760. (s numbers on curves; for p_u, values are 1 less.)



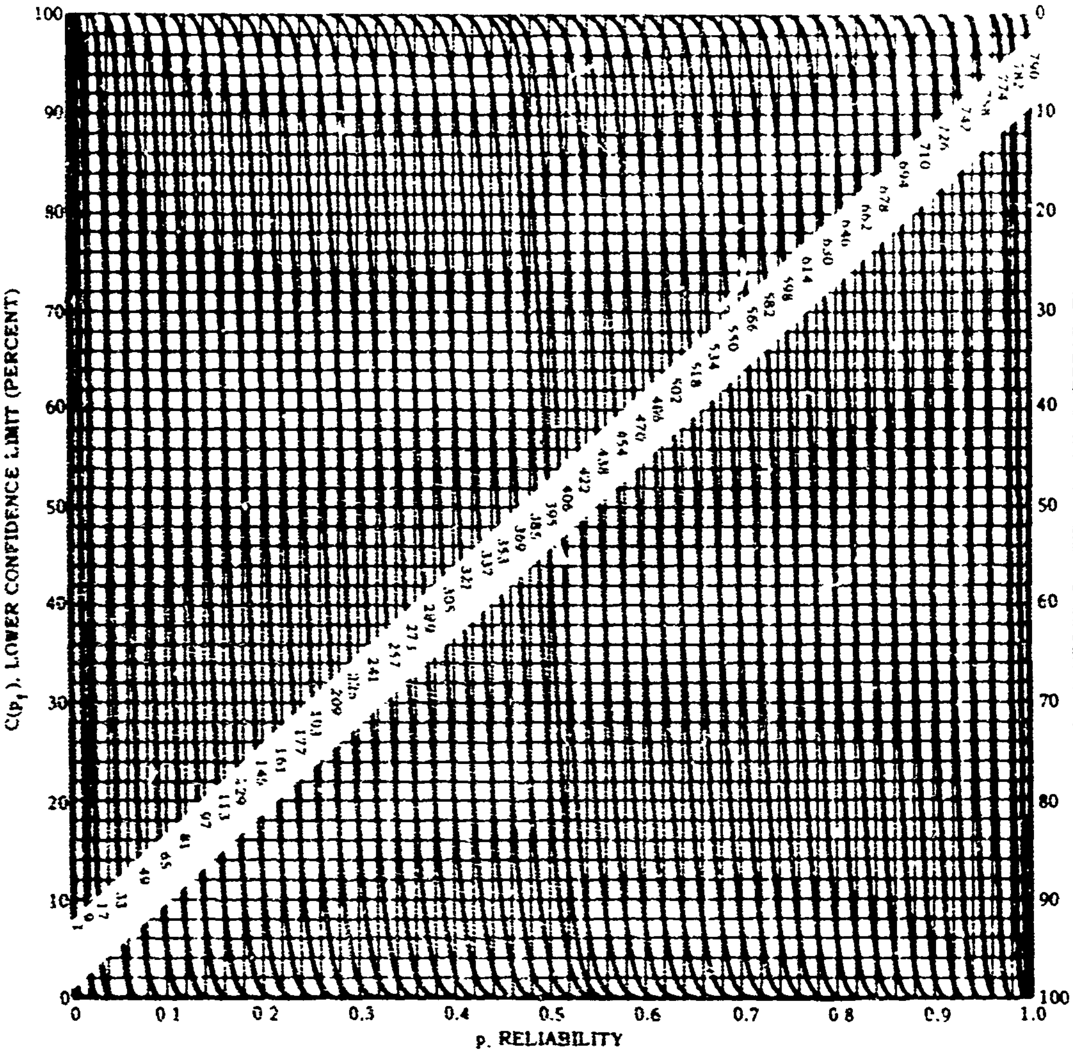
s, (s − 1) = 1,0; 2,1; 3,2, ... 770,769
(s + 1), s = 1,0, 2,1, 3,2, ... 770,769
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 167. Reliability Curves for n = 770. (s numbers on curves; for p_u, values are 1 less.)



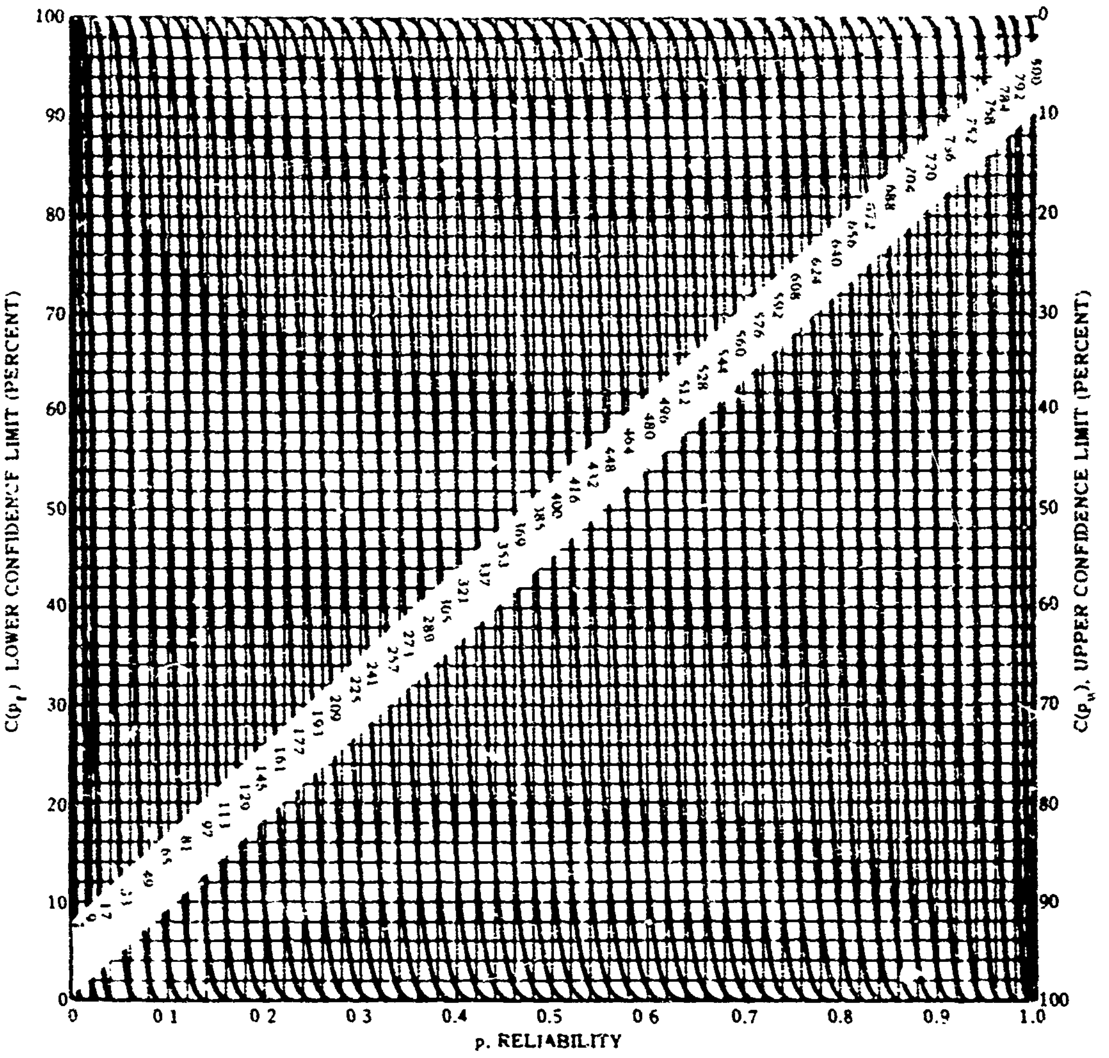
s, (s - 1) = 1,0; 2,1, 3,2, ..., 780,779
(s + 1), s = 1 0, 2,1, 3,2, ..., 780,779
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 168. Reliability Curves for n = 780. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1, 3,2, . . . 790 789
(s + 1), s = 1 0, 2,1, 3,2, . . . 790 789
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 169. Reliability Curves for n = 790. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ... 800,799

(s + 1), s = 1,0; 2,1; 3,2; ... 800,799

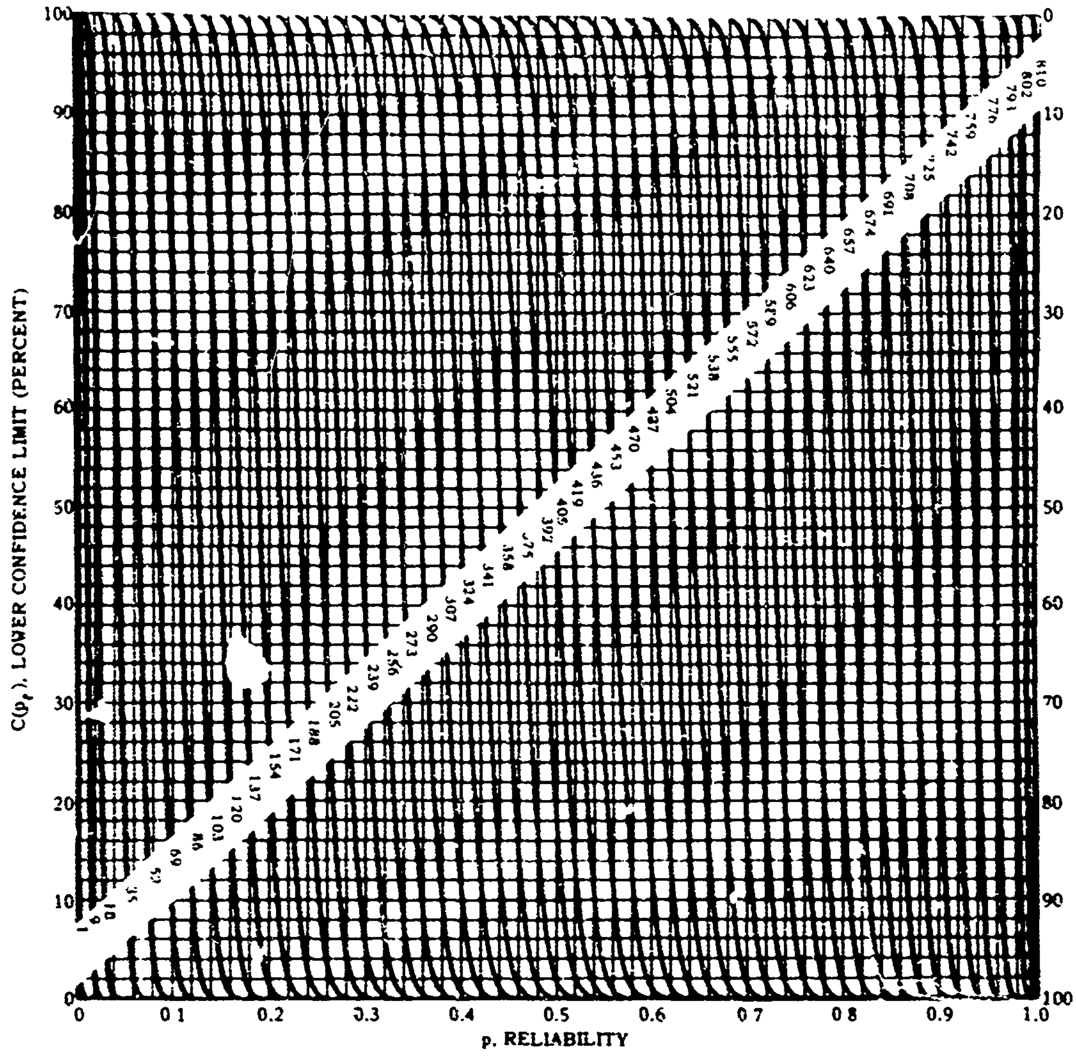
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)

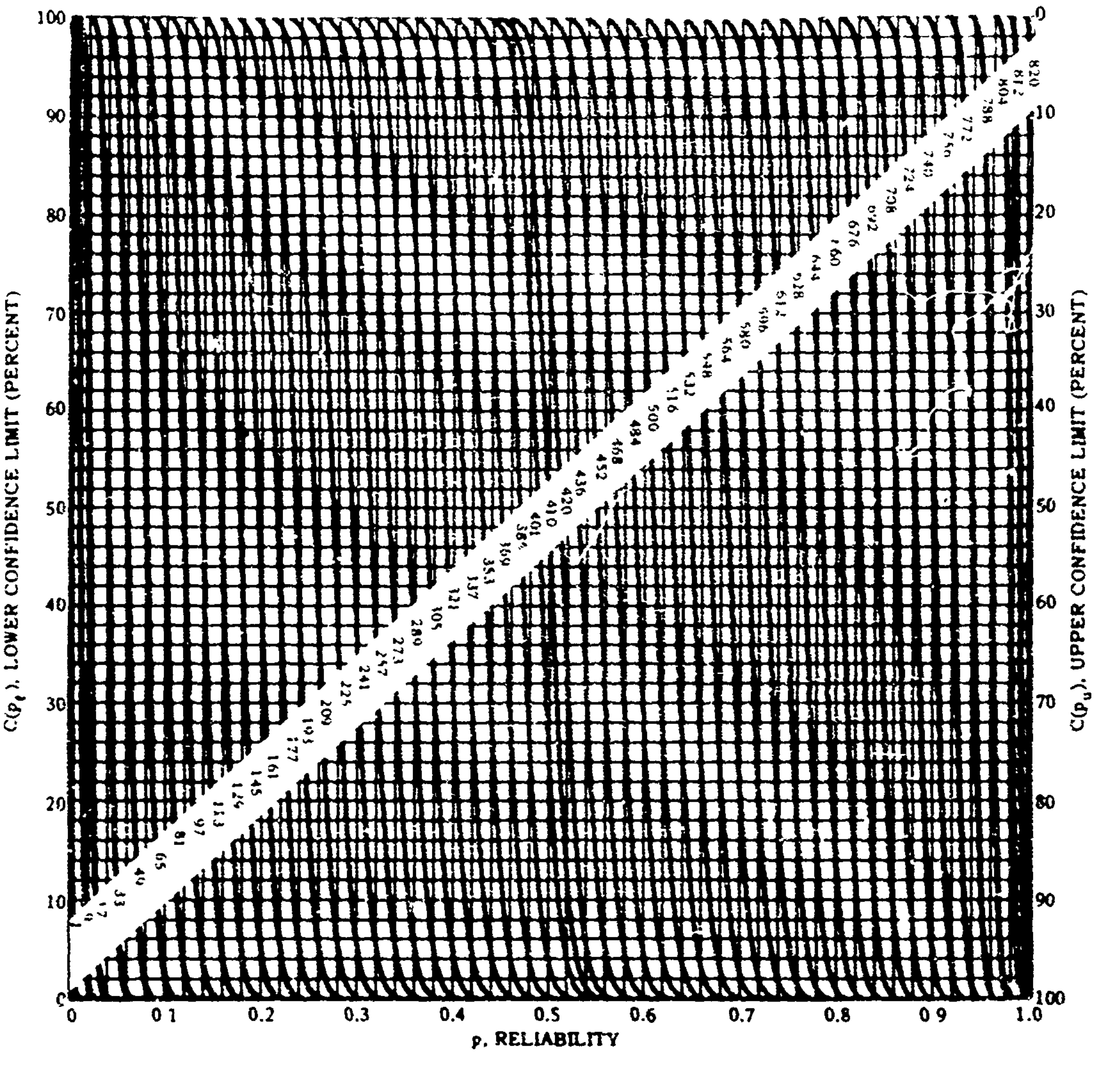
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 170. Reliability Curves for n = 800. (s numbers on curves; for p_u, values are 1 less.)



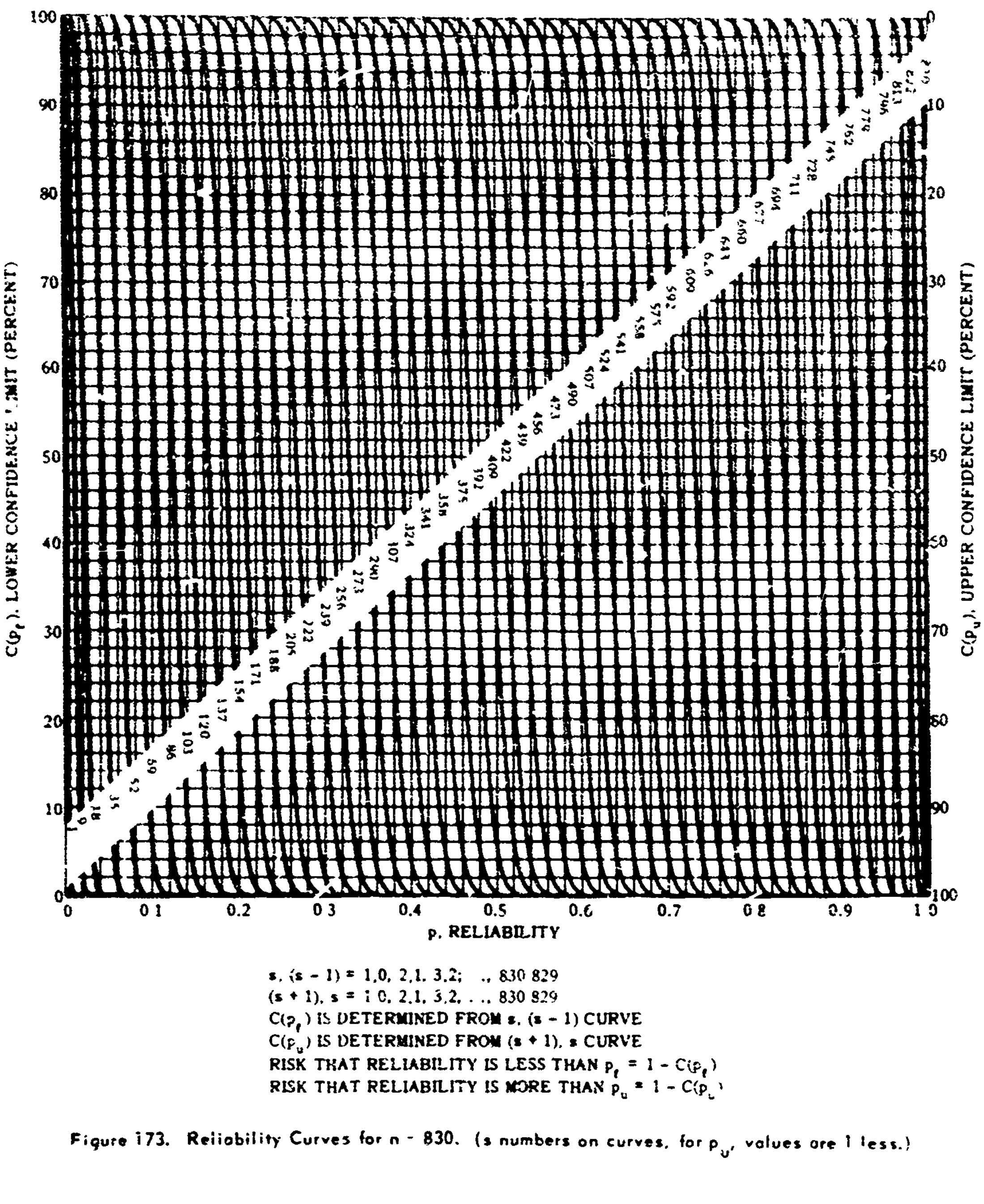
s, (s - 1) = 1,0; 2,1; 3,2; ...; 810,809
(s + 1), s = 1,0, 2,1, 3,2, ..., 810,809
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 171. Reliability Curves for n = 810. (s numbers on curves; for p_u, values are 1 less.)



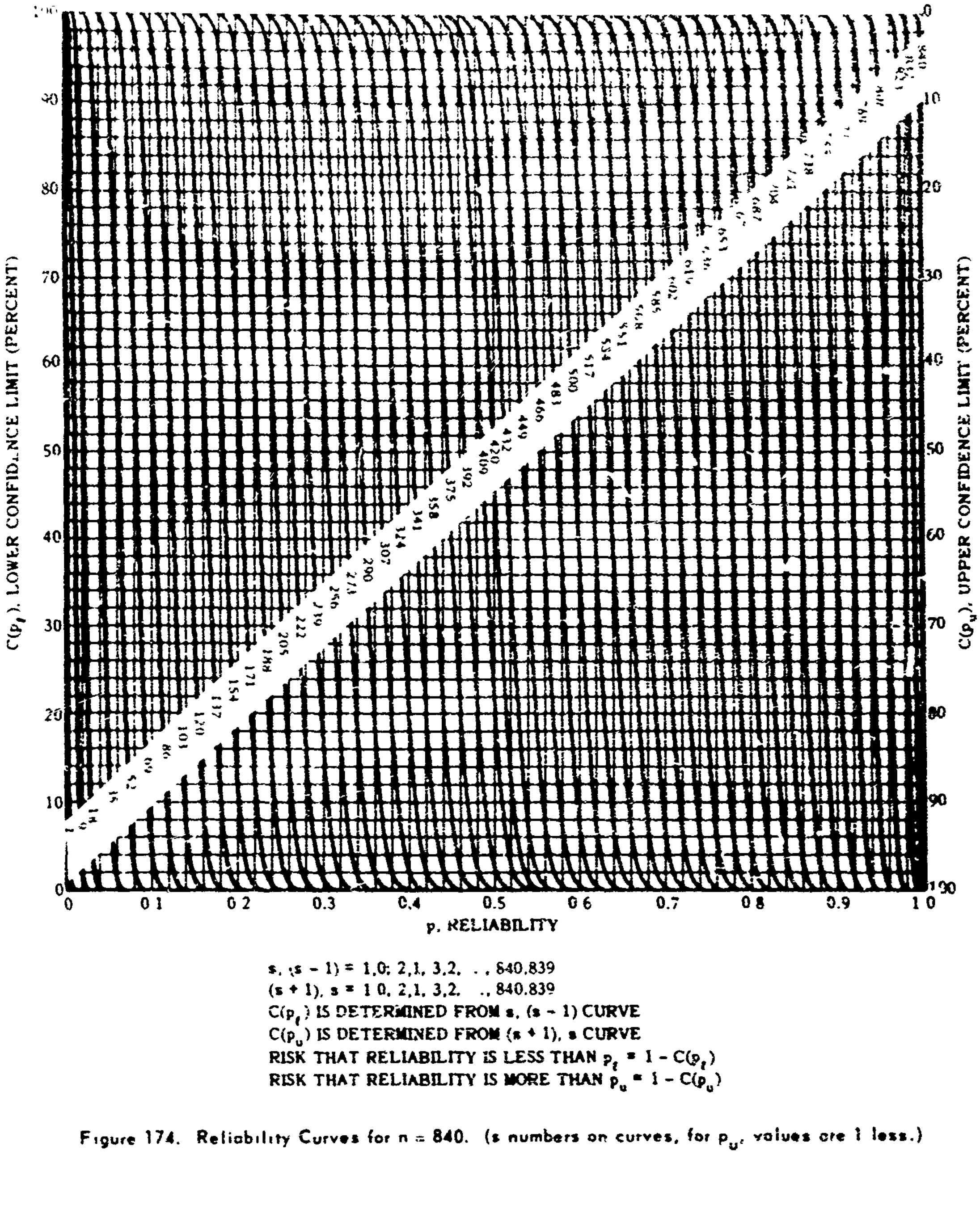
s (s − 1) = 1,0; 2,1, 3,2; ..., 820,819
(s + 1), s = 1,0, 2,1; 3,2, ..., 820,819
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 172. Reliability Curves for n = 820. (s numbers on curves; for p_u, values are 1 less.)



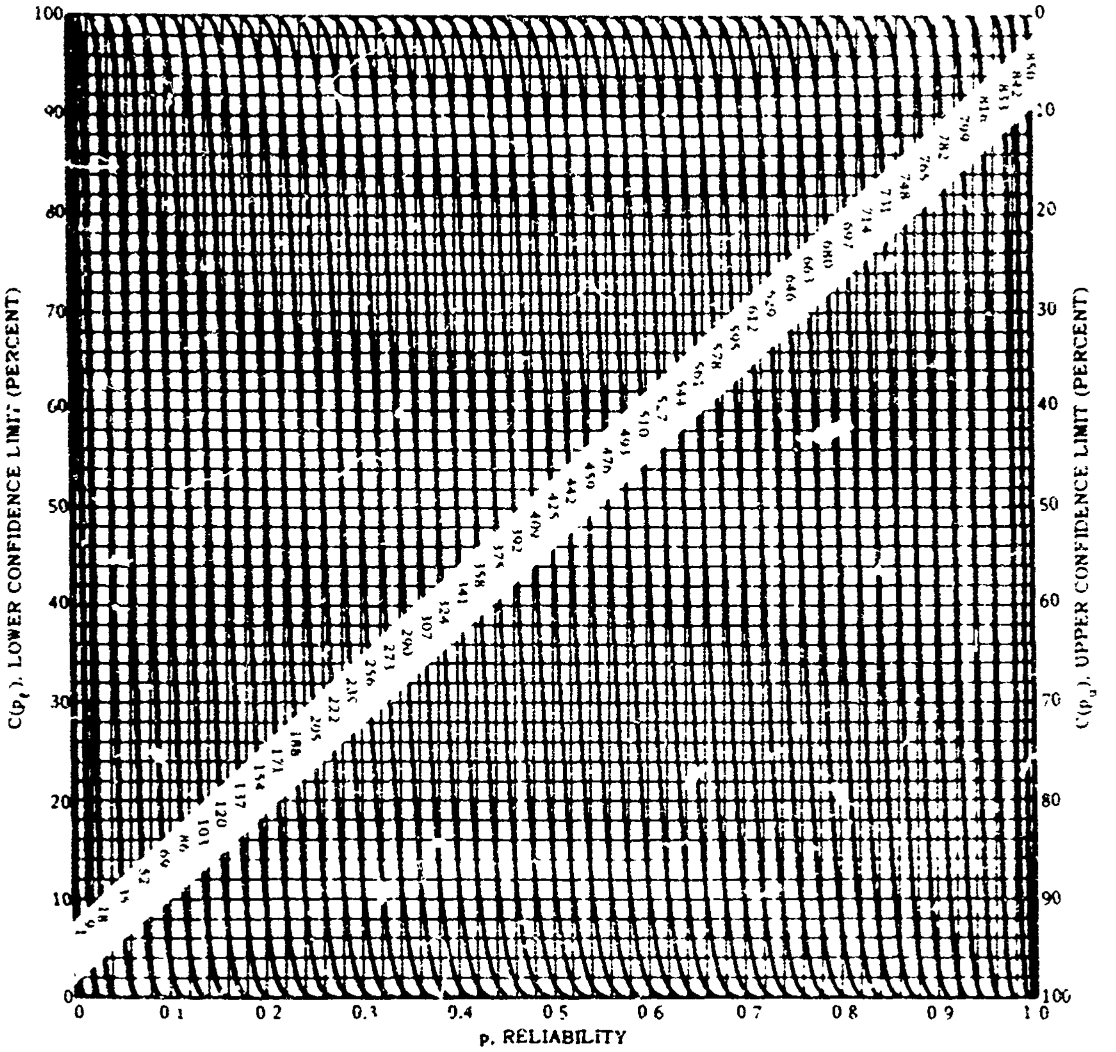
s, (s - 1) = 1,0, 2,1, 3,2; .., 830 829
(s + 1), s = 1 0, 2,1, 3,2, . . ., 830 829
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 173. Reliability Curves for n - 830. (s numbers on curves, for p_u, values are 1 less.)



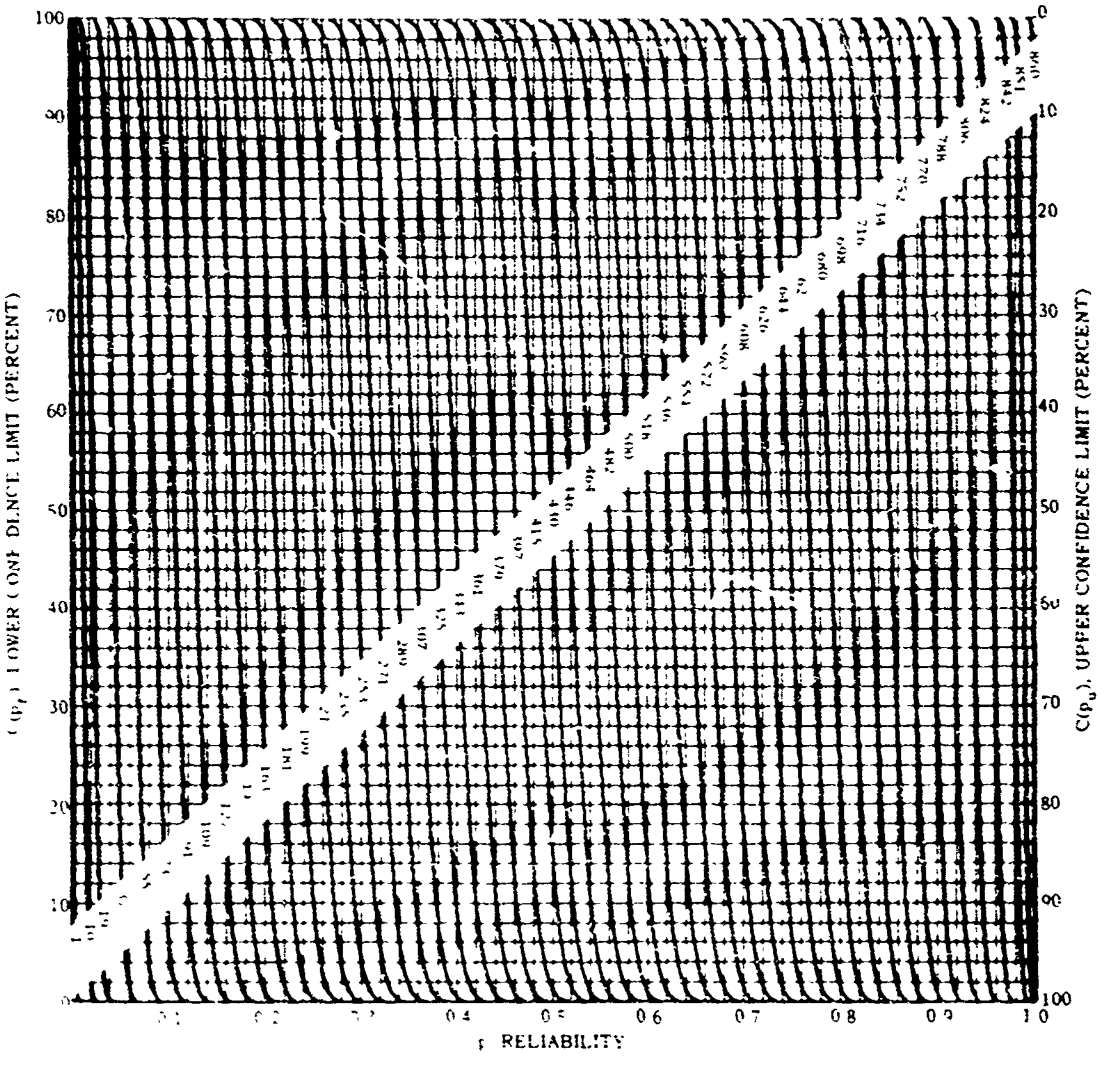
s, (s − 1) = 1,0; 2,1, 3,2, . . , 840,839
(s + 1), s = 1,0, 2,1, 3,2, . . , 840,839
C(p_l) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_l = 1 − C(p_l)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 174. Reliability Curves for n = 840. (s numbers on curves, for p_u, values are 1 less.)



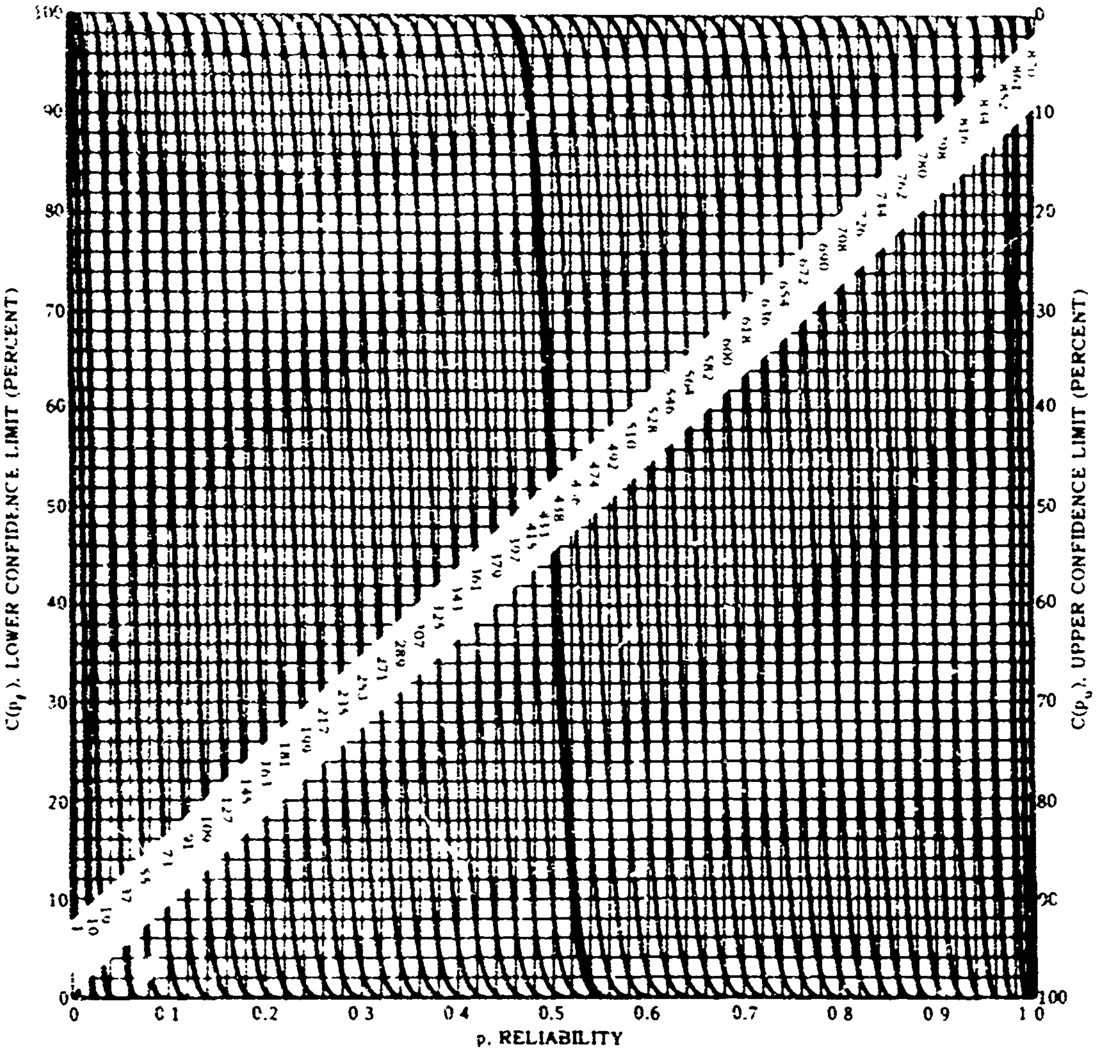
s (s - 1) = 1 0, 2 1, 3,2, . 850,849
(s + 1), s = 1 0, 2,1, 3,2, . 850,849
$C(p_\ell)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - $C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - $C(p_u)$

Figure 175. Reliability Curves for n = 850. (s numbers on curves, for p_u, values are 1 less.)



$(s, s-1) = 1\ 0,\ 2\ 1,\ 3\ 2, \ldots, 860\ 859$
$(s+1, s) = 1\ 0,\ 2\ 1,\ 3\ 2, \ldots, 860\ 859$
$C(p_\ell)$ IS DETERMINED FROM $(s, s-1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s+1, s)$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 176 Reliability Curves for n = 860 (s numbers on curves, for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2; ..., 870,869

(s + 1), s = 1,0; 2,1; 3,2; ..., 870,869

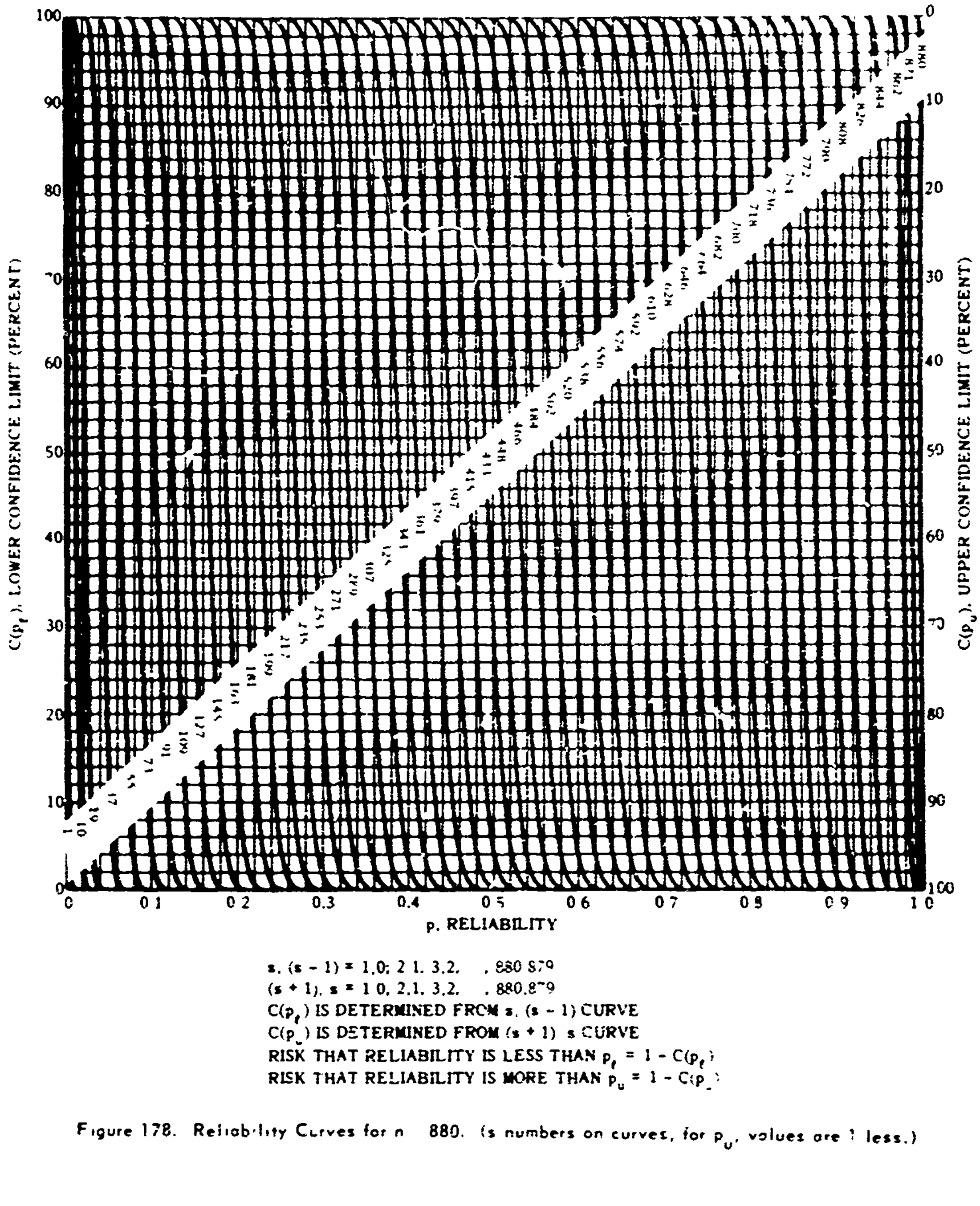
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1), s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)

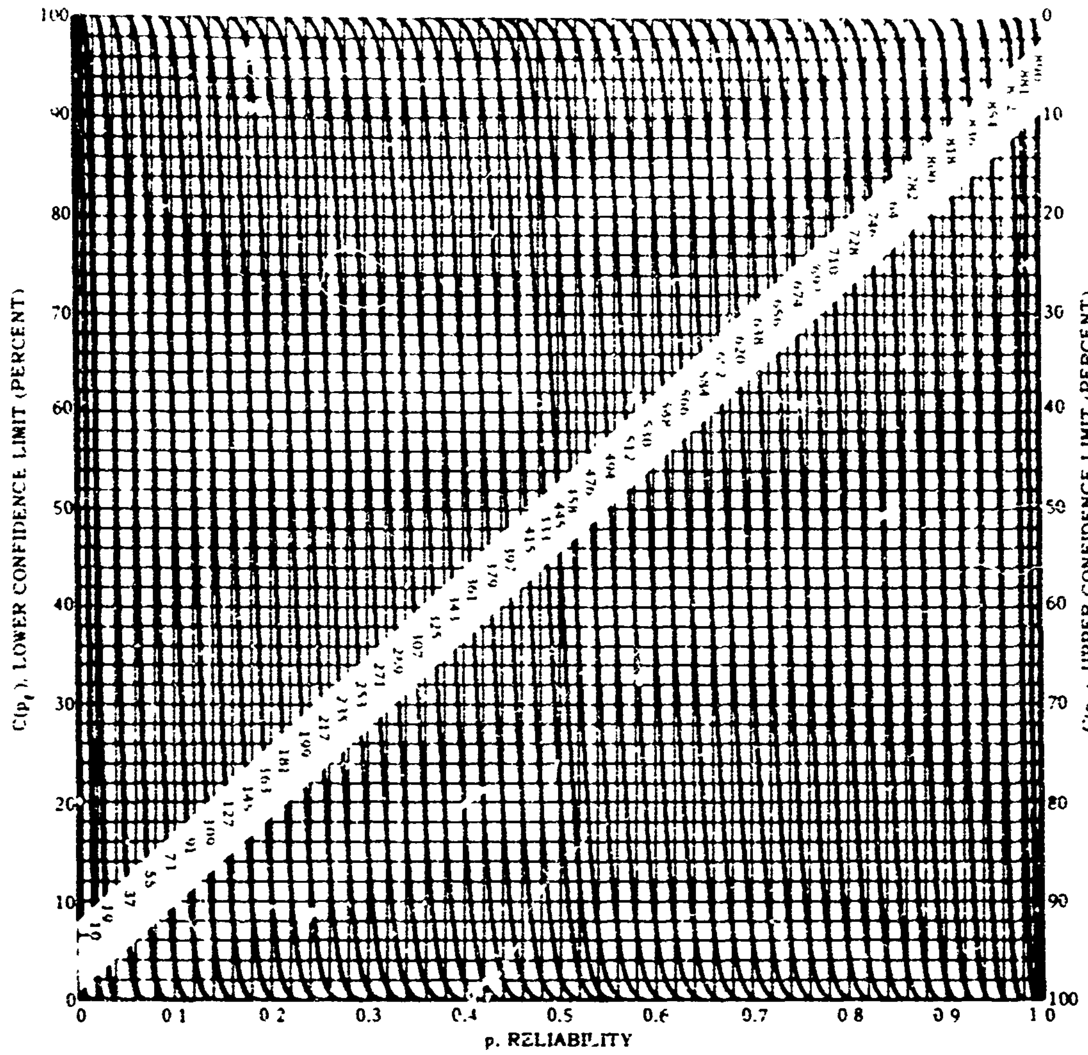
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 177. Reliability Curves for n = 870. (s numbers on curves; for p_u, values are 1 less.)



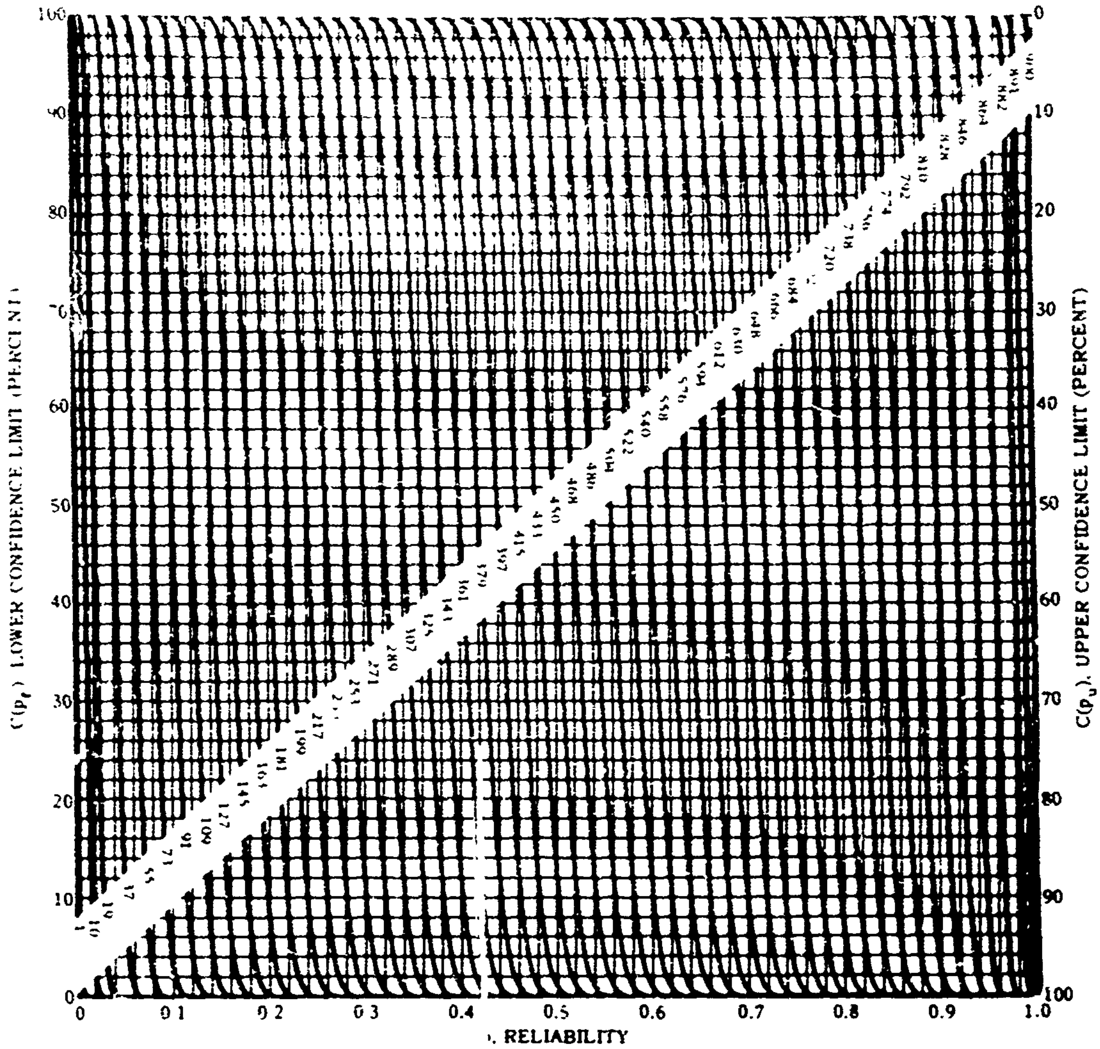
s, (s - 1) = 1,0; 2 1, 3,2, . 880 879
(s + 1), s = 1 0, 2,1, 3,2, . 880,879
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1) s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 178. Reliability Curves for n 880. (s numbers on curves, for p_u, values are 1 less.)



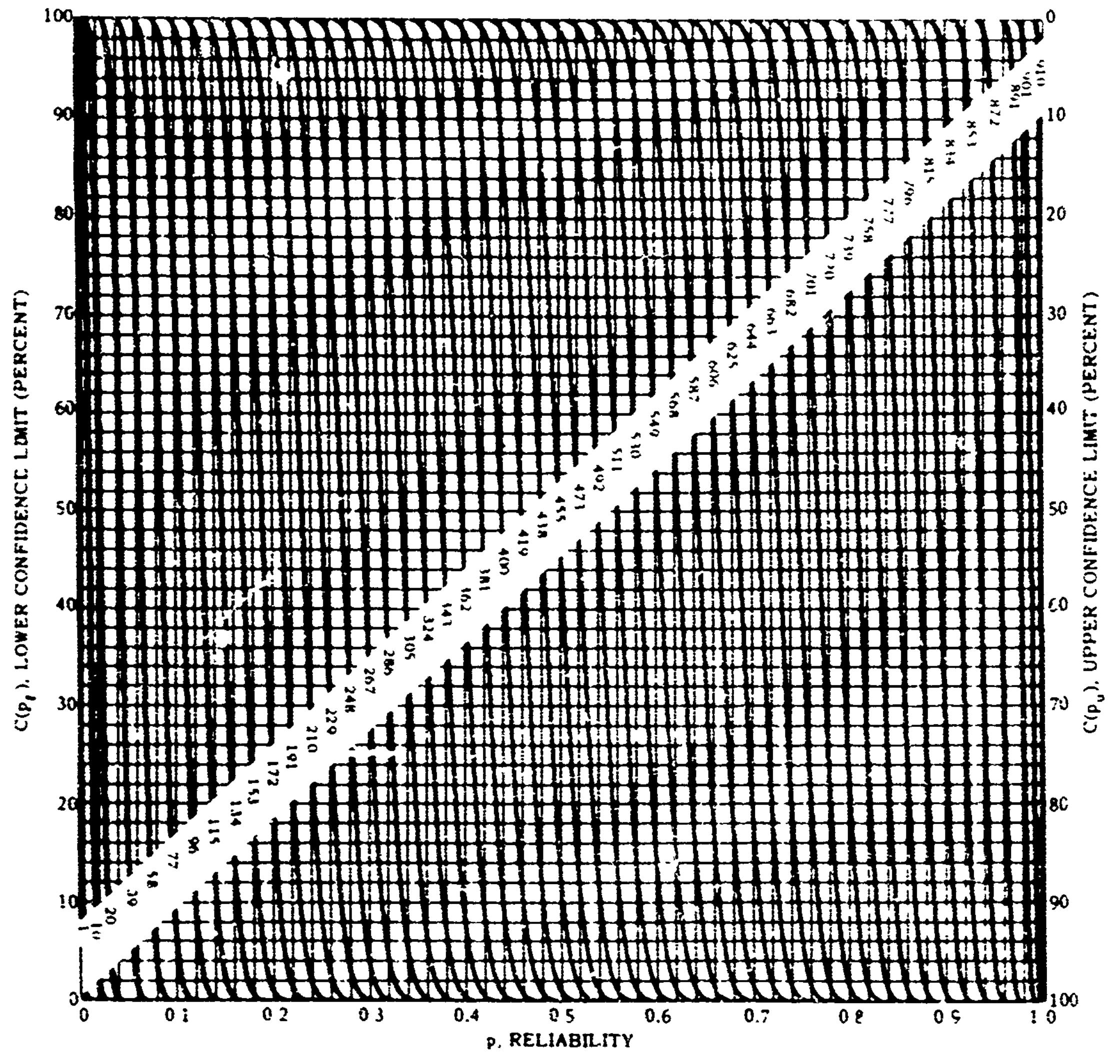
s, (s − 1) = 1,0; 2,1; 3,2; ..., 890,889
(s + 1), s = 1,0; 2,1; 3,2, ..., 890,889
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 179 Reliability Curves for n = 890. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1, 3,2, .., 900 899
(s + 1) s = 1 0, 2,1, 3,2, , 900 899
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 180. Reliability Curves for n = 900. (s numbers on curves; for p_u, values are 1 less.)



s (s - 1) = 1,0, 2,1, 3,2, . . . 910 909

(s + 1) s = 1 0, 2,1, 3,2, . . . 910 909

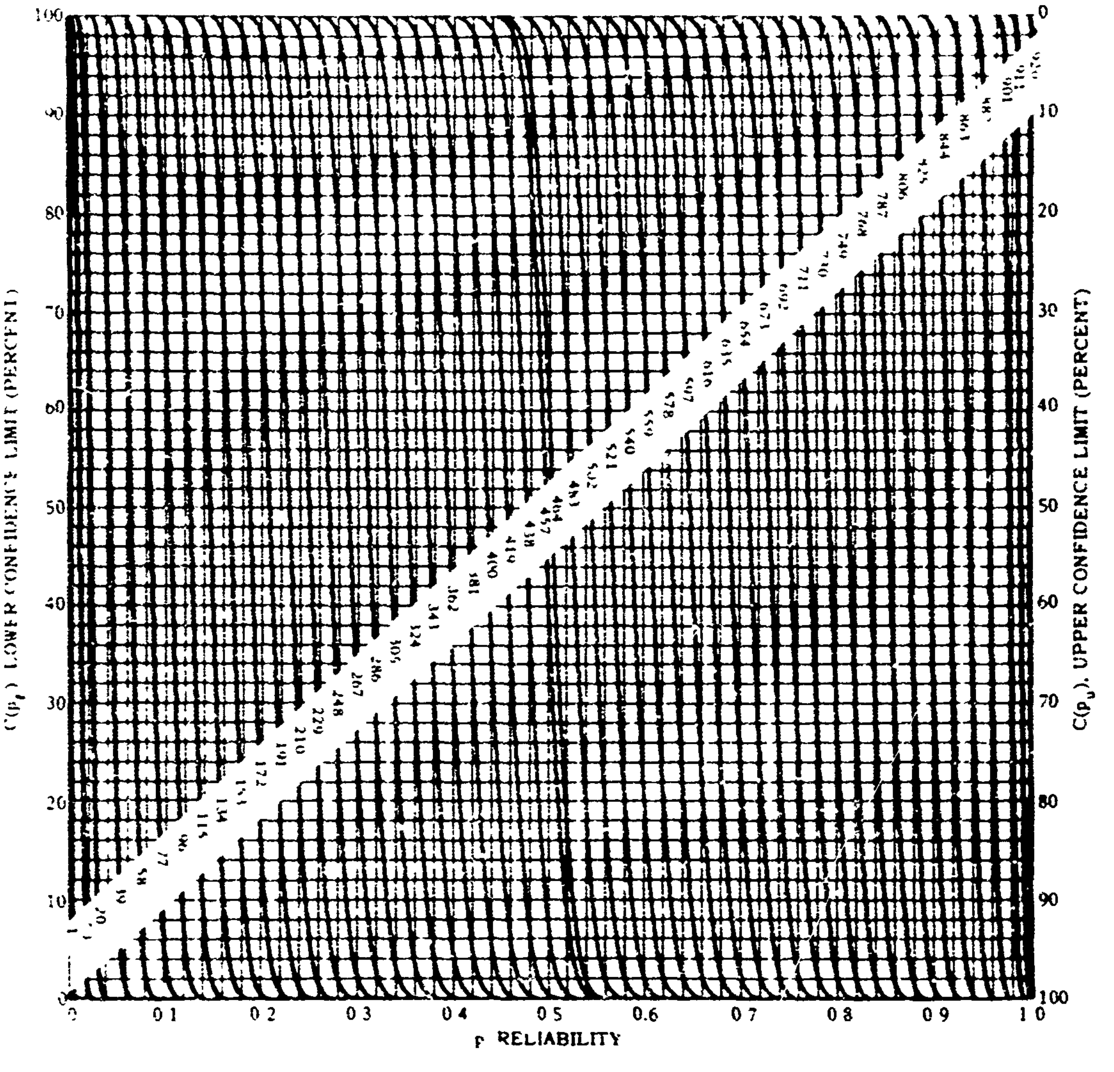
C(p_ℓ) IS DETERMINED FROM s (s - 1) CURVE

C(p_u) IS DETERMINED FROM (s + 1) s CURVE

RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)

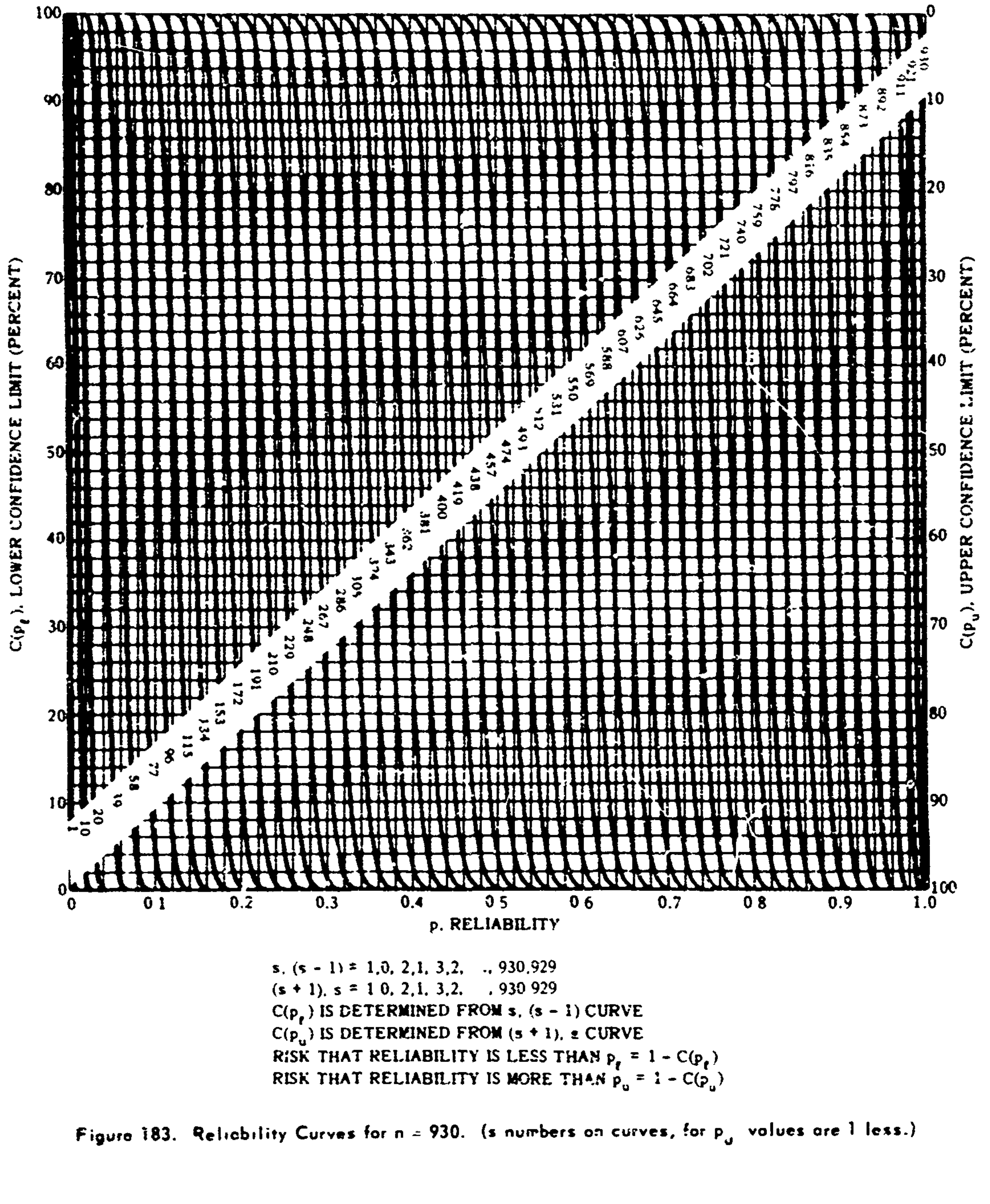
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 181. Reliability Curves for n = 910 (s numbers on curves, for p_u, values are 1 less.)



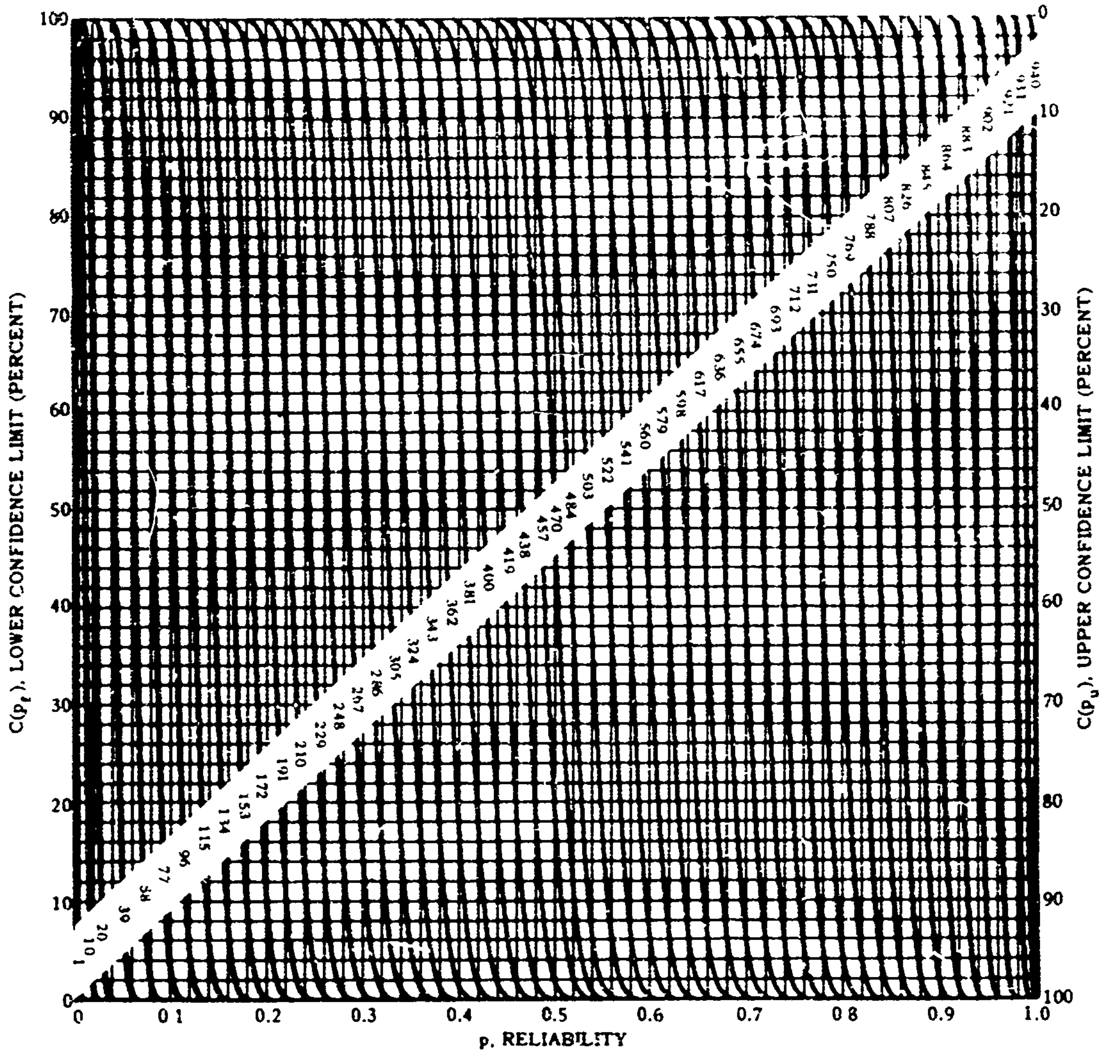
s, (s − 1) = 1,0, 2,1, 3,2, ..., 920,919
(s + 1), s = 1,0, 2,1, 3,2, ..., 920,919
C(p_ℓ) IS DETERMINED FROM s, (s − 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 − C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 − C(p_u)

Figure 182. Reliability Curves for = 920. (s numbers on curves; for p_u, values are 1 less.)



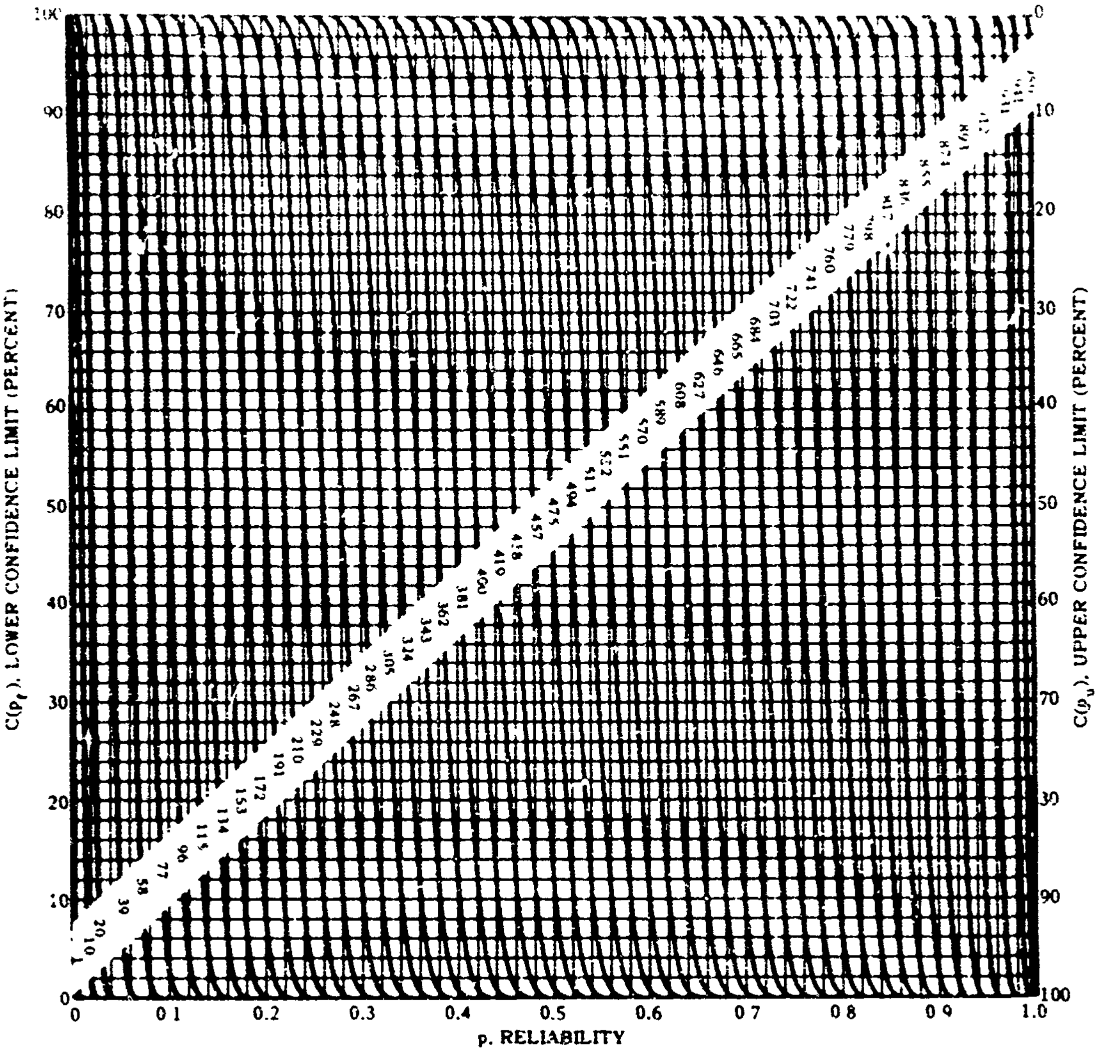
s, (s - 1) = 1,0, 2,1, 3,2, .., 930,929
(s + 1), s = 1 0, 2,1, 3,2, . 930 929
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 183. Reliability Curves for n = 930. (s numbers on curves, for p_u values are 1 less.)



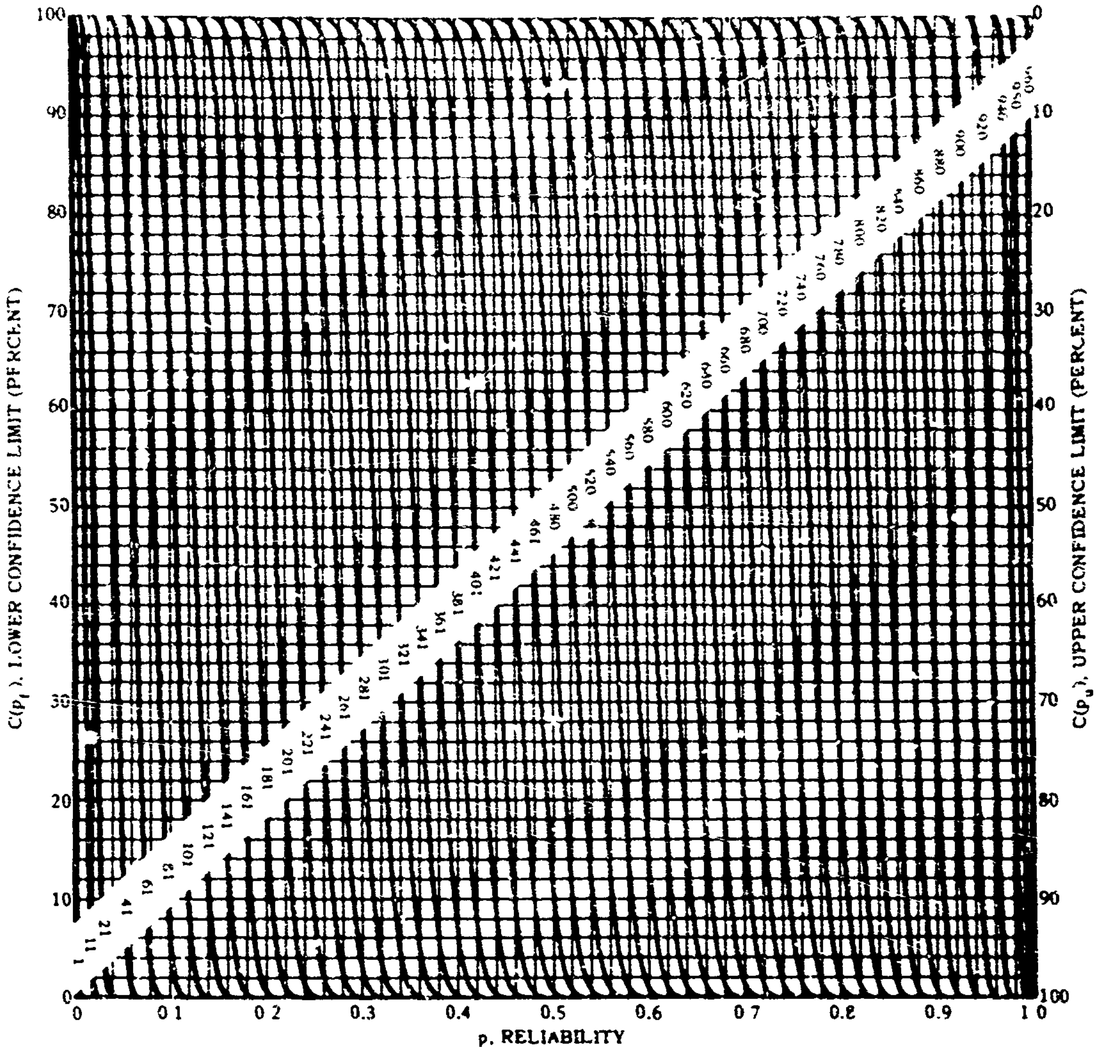
s (s - 1) = 1,0; 2,1; 3,2, ...; 940,939
(s + 1), s = 1,0; 2,1; 3,2, ...; 940,939
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 184. Reliability Curves for n = 940. (s numbers on curves; for p_u, values are 1 less.)



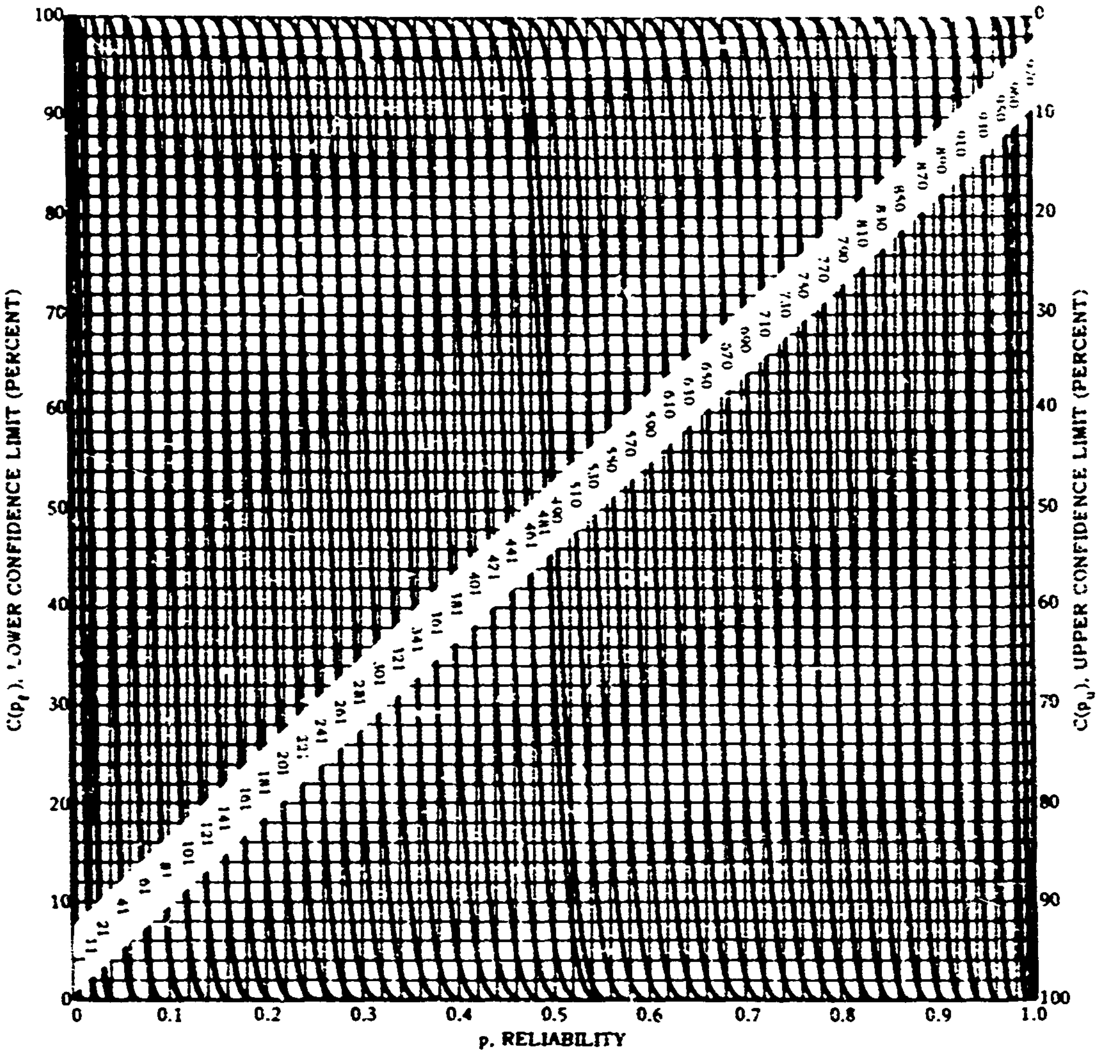
s, (s − 1) = 1,0; 2,1; 3,2, . . . , 950,949
(s + 1), s = 1,0; 2,1; 3,2, . . . , 950,949
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 185. Reliability Curves for n = 950. (s numbers on curves; for p_u, values are 1 less.)



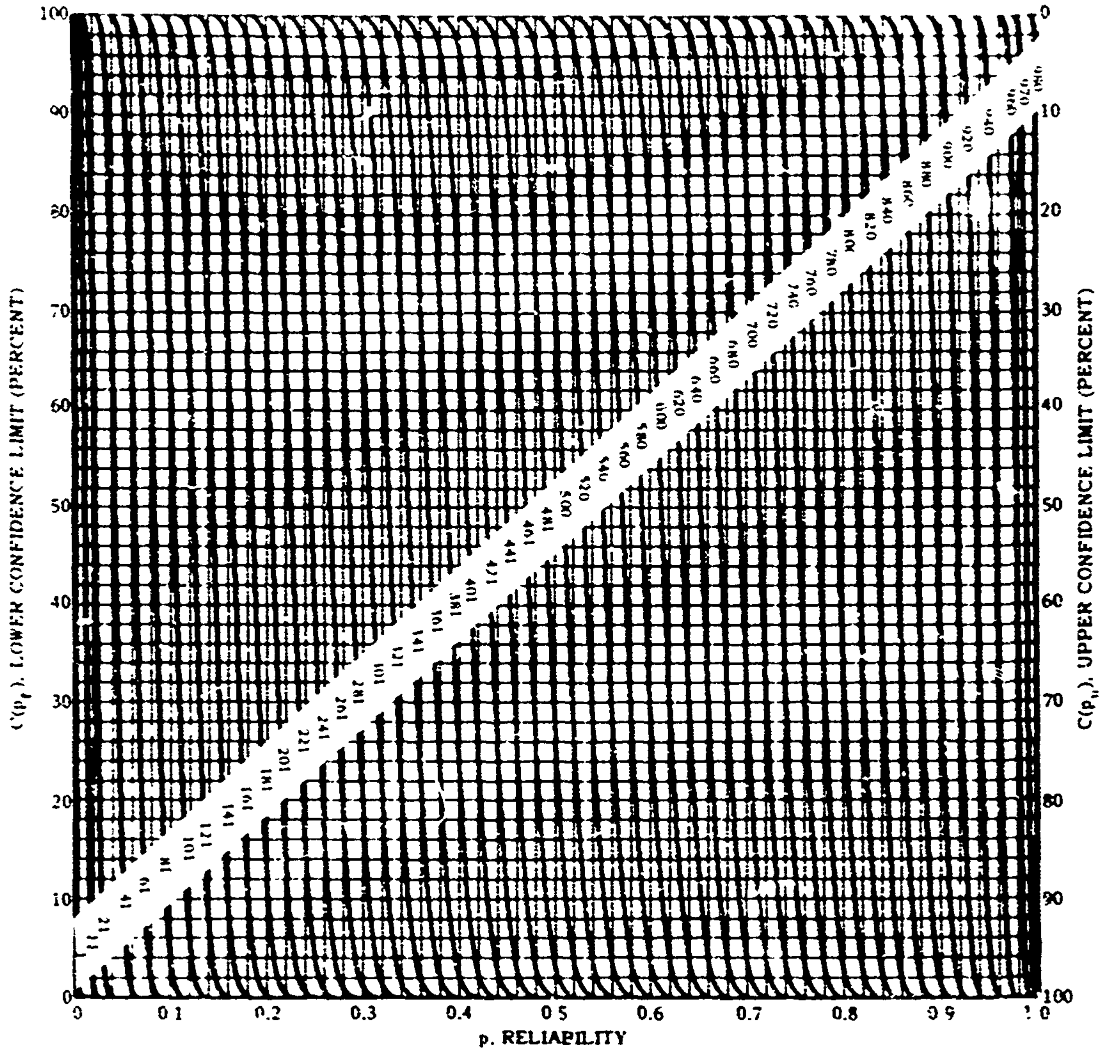
s, (s - 1) = 1,0; 2,1, 3,2; . 960,959
(s + 1), s = 1 0; 2 1, 3,2, . 960,959
$C(p_l)$ IS DETERMINED FROM s (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_l = 1 - C(p_l)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 186. Reliability Curves for n = 960 (s numbers on curves. for p_u, values are 1 less.)



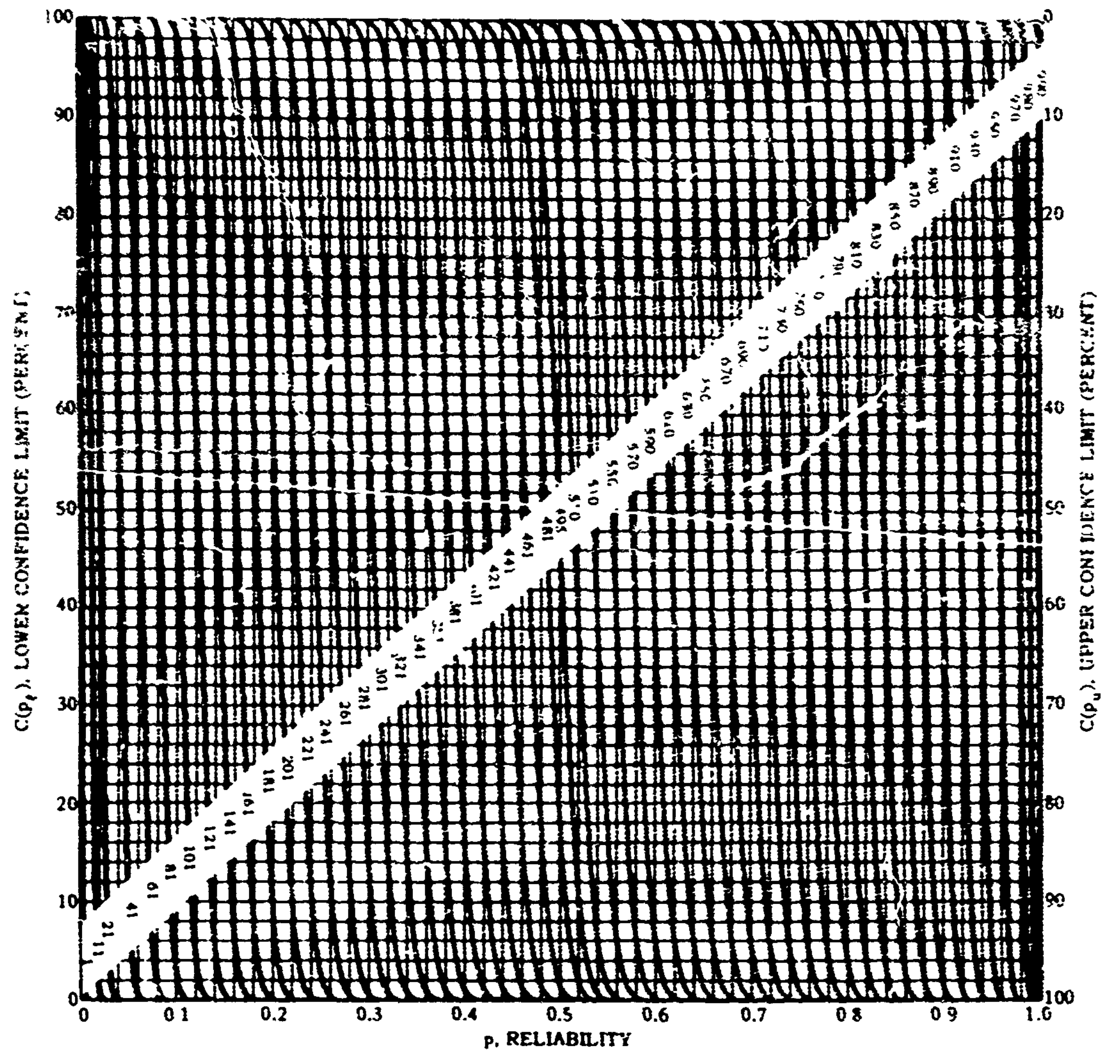
s, (s - 1) = 1,0; 2,1; 3,2; ...., 970,969
(s + 1), s = 1 0; 2,1; 3,2; ...; 970,969
C(p_ℓ) IS DETERMINED FROM s, (s - 1) CURVE
C(p_u) IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN p_ℓ = 1 - C(p_ℓ)
RISK THAT RELIABILITY IS MORE THAN p_u = 1 - C(p_u)

Figure 187. Reliability Curves for n = 970. (s numbers on curves; for p_u, values are 1 less.)



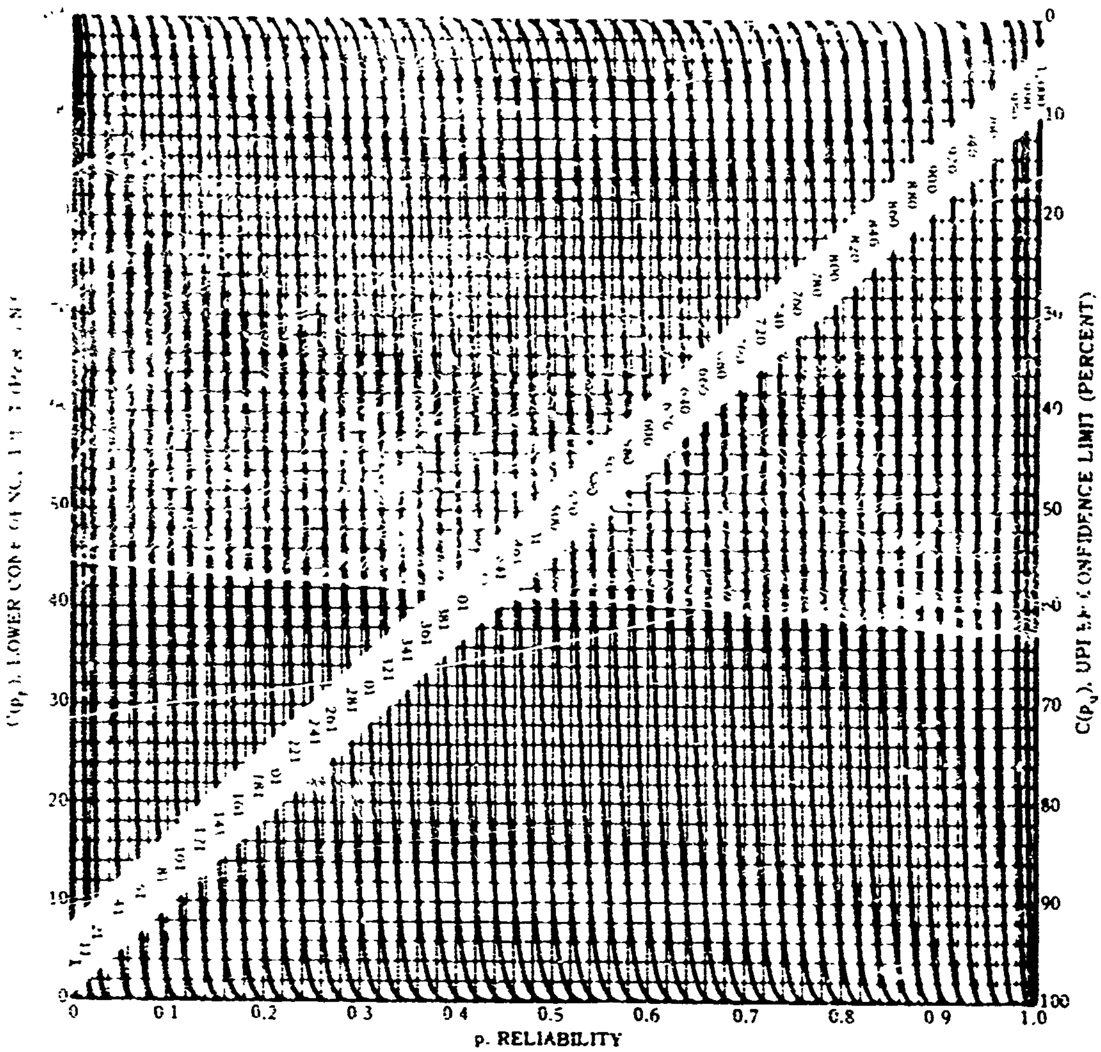
s, (s - 1) = 1,0; 2,1; 3,2, ...; 980 979
(s + 1), s = 1 0; 2,1, 3,2, ... 980,979
$C(p_\ell)$ IS DETERMINED FROM s, (s - 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 188. Reliability Curves for n = 980. (s numbers on curves; for p_u, values are 1 less.)



$s, (s - 1) = 1,0, 2,1, 3,2; \ldots; 990,989$
$(s + 1), s = 1,0; 2,1; 3,2, \ldots; 990,989$
$C(p_\ell)$ IS DETERMINED FROM $s, (s - 1)$ CURVE
$C(p_u)$ IS DETERMINED FROM $(s + 1), s$ CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 189. Reliability Curves for n = 990. (s numbers on curves; for p_u, values are 1 less.)



s, (s − 1) = 1,0; 2,1; 3,2, . . 1,000,999
(s + 1), s = 1 0; 2,1, 3,2, . . 1,000,999
$C(p_\ell)$ IS DETERMINED FROM s, (s − 1) CURVE
$C(p_u)$ IS DETERMINED FROM (s + 1), s CURVE
RISK THAT RELIABILITY IS LESS THAN $p_\ell = 1 - C(p_\ell)$
RISK THAT RELIABILITY IS MORE THAN $p_u = 1 - C(p_u)$

Figure 190. Reliability Curves for n = 1,000. (s numbers on curves; for p_u, values are 1 less.)

APPENDIX

CONVERSION FROM BINOMIAL TO HYPERGEOMETRIC DISTRIBUTION

Reference 1, page 19, gives formulas for approximating the hypergeometric distribution if results for the binomial distribution (such as the graphs of the present report) are given.

Let

N	= lot size
n	= sample size
s	= number of "successful" items in sample
$C_\ell(p_\ell, s, n)$	= confidence level
p_{ℓ_0}	= lower reliability for the binomial distribution (provided by the graphs)
p_ℓ	= lower reliability for the hypergeometric distribution

Then, from reference 1,

$$p_\ell \approx \frac{1}{N}\left[M p_{\ell_0} + \frac{1}{2}(s-1) - \frac{\delta}{24M}\right]$$

where

$$M = N - \frac{1}{2} n + \frac{1}{2}$$

and

$$\delta = \left(\frac{1}{1-p_{\ell_0}} - 1 + p_{\ell_0}\right)(n-s+1)^2 + \left(p_{\ell_0} - \frac{1}{p_{\ell_0}}\right)s^2$$

$$+ \left(2p_{\ell_0} - 1\right)\left[(s-1)(n-s) - 1\right] + \frac{1}{p_{\ell_0}} - \frac{1}{1-p_{\ell_0}}$$

As an example, consider $N = 25$, $n = 20$, $s = 13$, and $C_\ell(p_\ell; s, n) = 0.7$. From figure 20, $p_{\ell_0} \approx 0.565$. Then

$$\delta = \left(\frac{1}{0.435} - 0.435\right)(64) + \left(0.565 - \frac{1}{0.565}\right)(169) + (0.13)(83) + \frac{1}{0.565} - \frac{1}{0.435}$$

and

$$p_\ell \approx \frac{1}{25}\left[(15.5)(0.565) + 6 - \frac{\delta}{(24)(15.5)}\right] = 0.598$$

If δ is taken as zero, calculations give $p_\ell = 0.590$. From the tables of reference 1, the true value of p_ℓ is 0.600.

Again, consider N = 25, n = 10, s = 8, and $C_\ell(p_\ell; s,n) = 0.6$. From figure 10, $p_{\ell_0} \approx 0.705$. Then

$$\delta = \left(\frac{1}{0.295} - 0.295\right)(9) + \left(0.705 - \frac{1}{0.705}\right)(64) + (0.41)(13) + \frac{1}{0.705} - \frac{1}{0.295}$$

and

$$p_\ell \approx \frac{1}{25}\left[(20.5)(0.705) + 3.5 - \frac{\delta}{(24)(20.5)}\right] = 0.719$$

If δ is taken as zero, calculations give $p_\ell = 0.718$. From the tables of reference 1, the true value of p_ℓ is 0.720.

According to reference 1, δ can usually be taken as zero if $n < 0.4N$.

The corresponding formula for p_u is

$$p_u \approx \frac{1}{N}\left(Mp_{u_0} + \frac{1}{2}s - \frac{\delta}{24M}\right)$$

where

$$M = N - \frac{1}{2}n + \frac{1}{2}$$

and

$$\delta = \left(\frac{1}{1 - p_{u_0}} - 1 + p_{u_0}\right)(n - s)^2 + \left(p_{u_0} - \frac{1}{p_{u_0}}\right)(s + 1)^2$$

$$+ (2p_{u_0} - 1)\left[s(n - s - 1) - 1\right] + \frac{1}{p_{u_0}} - \frac{1}{1 - p_{u_0}}.$$

Consider N = 25, n = 20, s = 14, and $C_u(p_u; s,n) = 0.78$. Figure 20 gives $p_{u_0} \approx 0.792$. Then

$$\delta = \left(\frac{1}{0.208} - 0.208\right)(36) + \left(0.792 - \frac{1}{0.792}\right)(225) + (0.584)(69) + \frac{1}{0.792} - \frac{1}{0.208}$$

and

$$p_u \approx \frac{1}{25}\left[(15.5)(0.792) + 7 - \frac{\delta}{(24)(15.5)}\right] = 0.761$$

If δ is taken as zero, calculations give $p_u = 0.771$. From the tables of reference 1, the true value of p_u is 0.760.

Again, consider N = 25, n = 10, s = 6, and $C_u(p_u; s,n) = 0.74$. Figure 10 gives $p_{u_0} = 0.735$. Then

$$\delta = \left(\frac{1}{0.265} - 0.265\right)(16) + \left(0.735 - \frac{1}{0.735}\right)(49) + (0.47)(17) + \frac{1}{0.735} - \frac{1}{0.265}$$

and

$$p_u \approx \frac{1}{25}\left[(20.5)(0.735) + 3 - \frac{\delta}{(24)(20.5)}\right] = 0.720$$

If δ is taken as zero, calculations give $p_u = 0.723$. From the tables of reference 1, the true value of p_u is 0.720.

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13. ABSTRACT

Graphs are given for the determination of the upper and lower reliability confidence limits as defined by the number of successes in a random sample test. The graphs are for sample sizes from 1 to 100, and also from 100 to 1,000 in multiples of 10, and any number of successes. Two reliability results can be read directly from the graphs: the probability confidence that the reliability is at least p_ℓ, and that it is at most p_u.

The number of successes required for a particular sample to meet stated reliability confidence levels can be read. The graphs can also be used in determining whether the sample falls within predetermined risk levels.

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